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# NEW ZEALAND:

## HER COMMERCE AND RESOURCES.

BY

G. W. GRIFFIN,

*United States Consul at Auckland,*

Author of "My Danish Days," "Studies in Literature," "Memoir of C. S. Todd," &c.

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# PREFACE.

THE following pages consist of a series of papers furnished to the Department of State, Washington, and printed in the United States Consular Reports.

These papers were written by me at various dates since my appointment as Consul at Auckland, and have had such alterations and additions made to them, in their present form, by Dr. J. Hector, C.M.G., M.D., F.R.S., Director of the Colonial Geological Department, Wellington, and by Mr. W. R. E. Brown, Registrar-General and Government Statist, as were necessary to bring the statistical information up to the latest date.

G. W. GRIFFIN.

UNITED STATES CONSULATE,
AUCKLAND, DECEMBER, 1883.

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THROUGHOUT these papers, British money is computed at the price given by the New Zealand banks for the American dollar—namely, 4s. 2d.

The following tables show the values as laid down by the United States Treasury Regulations.

TABLE for the Reduction of Sterling Money of Great Britain to United States Gold Coin, under Act approved 3rd March, 1873, fixing the Value of the Pound Sterling at $4·8665. (Paragraph 488.)

[Prepared by the First Comptroller of the Treasury, 1st April, 1873.]

| — | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 .. .. | 4·8665 | 53·5315 | 58·398 | 63·2645 | 68·131 | 72·9975 | 77·864 | 82·7305 | 87·597 | 92·4635 |
| 2 .. .. | 9·733 | 102·1965 | 107·063 | 111·9295 | 116·796 | 121·6625 | 126·529 | 131·3955 | 136·262 | 141·1285 |
| 3 .. .. | 14·5995 | 150·8615 | 155·728 | 160·5945 | 165·461 | 170·3275 | 175·194 | 180·0605 | 184·927 | 189·7935 |
| 4 .. .. | 19·466 | 199·5265 | 204·393 | 209·2595 | 214·126 | 218·9925 | 223·859 | 228·7255 | 233·592 | 238·4585 |
| 5 .. .. | 24·3325 | 248·1915 | 253·058 | 257·9245 | 262·791 | 267·6575 | 272·524 | 277·3905 | 282·257 | 287·1235 |
| 6 .. .. | 29·199 | 296·8565 | 301·723 | 306·5895 | 311·456 | 316·3225 | 321·189 | 326·0555 | 330·922 | 335·7885 |
| 7 .. .. | 34·0655 | 345·5215 | 350·388 | 355·2545 | 360·121 | 364·9875 | 369·854 | 374·7205 | 379·587 | 384·4535 |
| 8 .. .. | 38·932 | 394·1865 | 399·053 | 403·9195 | 408·786 | 413·6525 | 418·519 | 423·3855 | 428·252 | 433·1185 |
| 9 .. .. | 43·7985 | 442·8515 | 447·718 | 452·5845 | 457·451 | 462·3175 | 467·184 | 472·0505 | 476·917 | 481·7835 |

NOTE.—To find the value of any number of pounds represented by one figure, find the figure in the left-hand margin of the table, and its value will appear in the column adjoining, opposite that figure. To find the value when expressed by two figures, look for the *tens* in the left-hand column, and for the *units* in the top margin, and the value will be shown in the place where the two columns meet: thus, the value of £57 is $277·3905. To find the value of £576, look for 57 as before, and move the decimal point one place to the right, and it shows $2,773·905; then add £6 as already shown, $29·199, and it gives the sum of $2,803·104.

One shilling equals $24\frac{133}{400}$ cents. One penny equals $2\frac{133}{4800}$ cents.

| — | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 .. | .. | ·24 | ·48 | ·73 | ·97 | 1·21 | 1·46 | 1·70 | 1·94 | 2·19 | 2·43 | 2·67 | 2·92 | 3·16 | 3·40 | 3·65 | 3·89 | 4·13 | 4·38 | 4·62 |
| 1 .. | ·02 | ·26 | ·50 | ·75 | ·99 | 1·23 | 1·48 | 1·72 | 1·96 | 2·21 | 2·45 | 2·69 | 2·94 | 3·18 | 3·42 | 3·67 | 3·91 | 4·15 | 4·40 | 4·64 |
| 2 .. | ·04 | ·28 | ·52 | ·77 | 1·01 | 1·25 | 1·50 | 1·74 | 1·98 | 2·23 | 2·47 | 2·71 | 2·96 | 3·20 | 3·44 | 3·69 | 3·93 | 4·17 | 4·42 | 4·66 |
| 3 .. | ·06 | ·30 | ·54 | ·79 | 1·03 | 1·27 | 1·52 | 1·76 | 2·00 | 2·25 | 2·49 | 2·73 | 2·98 | 3·22 | 3·46 | 3·71 | 3·95 | 4·19 | 4·44 | 4·68 |
| 4 .. | ·08 | ·32 | ·56 | ·81 | 1·05 | 1·29 | 1·54 | 1·78 | 2·02 | 2·27 | 2·51 | 2·75 | 3·00 | 3·24 | 3·48 | 3·73 | 3·97 | 4·21 | 4·46 | 4·70 |
| 5 .. | ·10 | ·34 | ·58 | ·83 | 1·07 | 1·31 | 1·56 | 1·80 | 2·04 | 2·29 | 2·53 | 2·77 | 3·02 | 3·26 | 3·50 | 3·75 | 3·99 | 4·23 | 4·48 | 4·72 |
| 6 .. | ·12 | ·36 | ·60 | ·85 | 1·09 | 1·33 | 1·58 | 1·82 | 2·06 | 2·31 | 2·55 | 2·79 | 3·04 | 3·28 | 3·52 | 3·77 | 4·01 | 4·25 | 4·50 | 4·74 |
| 7 .. | ·14 | ·38 | ·62 | ·87 | 1·11 | 1·35 | 1·60 | 1·84 | 2·08 | 2·33 | 2·57 | 2·81 | 3·06 | 3·30 | 3.54 | 3·79 | 4·03 | 4·27 | 4·52 | 4·76 |
| 8 .. | ·16 | ·40 | ·64 | ·89 | 1·13 | 1·37 | 1·62 | 1·86 | 2·10 | 2·35 | 2·59 | 2·83 | 3·08 | 3·32 | 3·56 | 3·81 | 4·05 | 4·29 | 4·54 | 4·78 |
| 9 .. | ·18 | ·42 | ·66 | ·91 | 1·15 | 1·39 | 1·64 | 1·88 | 2·12 | 2·37 | 2·61 | 2·85 | 3·10 | 3·34 | 3·58 | 3·83 | 4·07 | 4·31 | 4·56 | 4·80 |
| 10 .. | ·20 | ·44 | ·68 | ·93 | 1·17 | 1·41 | 1·66 | 1·90 | 2·14 | 2·39 | 2·63 | 2·87 | 3·12 | 3·36 | 3·60 | 3·85 | 4·09 | 4·33 | 4·58 | 4·82 |
| 11 .. | ·22 | ·46 | ·70 | ·95 | 1·19 | 1·43 | 1·68 | 1·92 | 2·16 | 2·41 | 2·65 | 2·89 | 3·14 | 3·38 | 3·62 | 3·87 | 4·11 | 4·35 | 4·60 | 4·84 |

NOTE.—This table shows the value of every combination of shillings and pence less than £1; the upper margin representing the shillings, and the left-hand margin the pence. Thus, to find the value of 17s. 6d., follow column 17 downwards until it meets the left-hand column opposite 6, and it shows $4·25. By this method any number of pounds, shillings, and pence can be reduced to United States gold quickly and accurately.

# NEW ZEALAND: HER COMMERCE AND RESOURCES.

## GENERAL REMARKS.

The Colony of New Zealand is one of the most interesting and prosperous in the British dominions. It consists of three islands and several islets, lying in the Pacific Ocean, between the parallels 34° 15′ and 47° 30′ S. lat., and between the meridians 166° and 179° E. long.; they are about 6,000 miles from San Francisco and 13,000 from London.

The total area is 104,403 square miles, forming an extent of country greater than that of England and Scotland put together, and nearly equal in size to the peninsula of Italy.

The North Island is 500 miles in length, and varies from 6 to 300 miles in breadth. The Middle Island is 550 miles in length, and has an average breadth of 120 miles.

Cook Strait separates the North Island from the Middle Island, and Foveaux Strait separates the Middle Island from Stewart Island, which is shaped like a triangle, and is only thirty-six miles in length. About one-tenth of the surface of the North Island is covered with mountains, but they do not reach as great a height as those on the Middle Island, where some of the peaks attain an altitude of over 12,000 feet. These mountains are called the Southern Alps, and abound in scenery of surpassing beauty and magnificence.

The Government of New Zealand is like that of other British colonies. It consists of a Legislative Council appointed for life, and a House of Representatives containing ninety-one members, elected for three years by the people, and four Maori members, elected by the Maori race. The Governor of the colony is appointed by the Crown. The Ministry is formed in the same manner as that of Great Britain.

The population of the colony was, on the 31st December, 1882, about 561,804. Of these, about 44,000 belong to the Maori or aboriginal race. It is estimated that at the end of the year 1883 the total population will exceed 584,000 persons. The number of Maoris is becoming smaller every year, and in time they will disappear from the country. They resemble the Samoans in character and complexion. They had no written language of their own, and, of course, are ignorant of their origin. The missionaries have, however, reduced their language to writing, and the Bible and a number of other books have been translated into the Maori dialect. They are alternately brave and treacherous, and are superstitious in the extreme. They abhor work. They have good memories. They pride themselves on their oratory, and have an easy flow of language. They excel, perhaps, all the other inhabitants of the South Sea Islands in tattooing their faces and bodies. Many reasons are assigned for this practice. Some say that they honour it because it is one of their ancient customs. Others tell me that they thus mark themselves in order to look fierce in battle. A stately-looking chief once informed me that he tattooed himself because he wanted to conceal his age. "To tell the truth," said he, "I wish to appear young;" and as far as I could judge he did appear young. They have no word for gratitude in their language, but are hospitable to strangers and generous to their kindred. They acquire all the vices of the whites, and but few of their virtues. They are fond of fighting among themselves, and would practise cannibalism if it were not for the restraining influence of the British Government and the abundance of pigs and other kinds of food. They are slow and heavy in their movements, deliberate in speech, and filthy in their persons and habits. They possess some imitative genius, but are below other savage races in this respect. They have a great aversion to wearing clothes, and adopting habits of civilization. There is little in their ancient religion or mythology to commend it.

The Maoris are now, and have been for many years, nominally Christians. In 1864 there was a revival of their old superstitions, mixed with perversions from the Bible. The missionaries for a time lost much of their influence over the Natives.

I made a tour recently through the principal towns and cities of the colony, with a view of studying the wants of the people, and taking into consideration the best means for the enlargement of the trade and commerce between New Zealand and the United States. I was everywhere well received. My arrival at each city along the route was telegraphed to the Associated Press, and the people vied with one another in showing me kindness.

At Wellington the Premier received me in the most cordial manner. He assured me that I would find the subject of the enlargement of the trade between New Zealand and the United States a very popular one with the colonists. He gave me letters of introduction to prominent men in various parts of the country, and caused to be forwarded to my address at Auckland many valuable public documents for the use of the Consulate. I stopped in Wellington long enough to visit the Houses of Parliament, the Colonial Museum, the residence of the Governor, the two cathedrals, and the building known as the Government Offices, which is said to be the largest wooden edifice in the world. The population of Wellington, including the suburbs, is about 22,700.

I visited Christchurch next. This city has grown very rapidly within the last few years. In 1871 its population was only about 7,000: it is now, according to the last census, 15,213, and if the suburbs were included the total population would then have been 30,715. The Province of Canterbury, in which Christchurch is situated, is one of the richest agricultural regions in New

Zealand, and an Agricultural and Pastoral Exhibition held within a few miles of the city was actually unsurpassed in the Australasian Colonies. The horses, sheep, and cattle exhibited there were among the finest in the world. At this Exhibition, which I attended, over twenty thousand people visited the ground during the day. I was greatly impressed with the magnificent display of American machinery and agricultural implements, also many other branches of American industry. I saw the American flag flying in various parts of the grounds over the display of Singer's sewing machines, the Grover and Baker machine, Davis, White, Wheeler and Wilson, and others; also over the courts allotted to the exhibitors of American carriages, buggies, wagons, harness, ironmongery, boots, shoes, woodware, toilet articles, rubber goods, &c. The prizes offered were very liberal, and the foremost men in the country did their utmost to promote the interests of the Exhibition by encouraging home industries and inviting foreign competitors.

The public and private buildings in Christchurch will compare very favourably with those in the large cities of Europe and America. The cathedral, which has just been opened for service, though still unfinished, has cost over £41,666, or $200,000, and is one of the most beautiful in the Southern Hemisphere.

From Christchurch I went to Port Chalmers, the seaport of the City of Dunedin. It is built on a peninsula, jutting out into the harbour, half-way between the heads and Dunedin. The railway comes down to the pier, and every facility is afforded for loading and unloading vessels.

Dunedin, the southern capital, is eight miles by rail from Port Chalmers. It is built upon a series of terraces, which run gradually to a height overlooking the harbour and surrounding country. The city covers an area of 865 acres. In 1848 it had but one church and about 300 people. Now its population, including the suburbs, is over 43,000, the city proper containing, in December, 1882, 25,244. It has ninety streets, all of which are regularly laid out, many 60 feet in width. The streets are well paved, and have asphalted side-walks. Princes Street is two and a half miles in length, and has long rows of elegant houses. The architectural taste displayed in the public and private buildings of Dunedin, together with its libraries and seats of learning, have given it the name of the Modern Athens. The town hall, which is a model of architectural beauty, is said to have cost £52,083, or $250,000. There are four daily papers published in the city, and several weekly journals and magazines. Dunedin is well supplied with gas and water, and is traversed by steam-tramways with American-built carriages.

The system of education in the colony is practically the same as in the United States. There is a compulsory clause in the Education Act for the attendance of pupils, and the people have resisted every attempt to control the schools for denominational purposes.

The present system of education was inaugurated in New Zealand in 1877. At first it was thought that the standard was too high, and some objection was made to the compulsory clause of the Education Act, and to the cost of free education to the taxpayers; but these objections have been overruled, and the system upon the whole is found to work admirably.

There are 911 public Government schools in operation in various parts of the colony, with 737 masters, 130 assistant-masters, 169 male pupil-teachers, 327 mistresses, 281 assistant-mistresses, 499 female pupil-teachers, and the average attendance of pupils in December, 1882, was 68,288. The total expenditure for the maintenance of the public schools last year was £353,111, or $1,694,933. This sum is inclusive of the cost of the School Boards, salaries of teachers, school-buildings, &c.

The various institutions for higher education in the colony are affiliated to the University of New Zealand, which is empowered by Royal charter to confer degrees ranking with those of the British Universities.

I left Dunedin on the 3rd November to visit the New Zealand Agricultural Company's estate on the Waimea Plains. This magnificent property is situated about 120 miles from Dunedin. The first station I stopped at was Gore, ninety-nine miles from Dunedin. Here I took the Waimea Railway, one of the few lines of railway in the colony not owned by the Government. It was built under the supervision of Mr. Henry Driver, member of the House of Representatives, and United States Consular Agent at Dunedin, whose fine abilities have made him quite a power in the land. The property consists of 310,000 acres, of which 168,000 acres are freehold and 142,000 leasehold land. It is the purpose of the company to sell a large part of this land to immigrants on the deferred-payment system. The entire estate is fertile and well watered, and no part of it is more than five miles from a railway station. There are on the estate 3,000 horses, a large number of thoroughbred cattle, and over 300,000 sheep. The land under cultivation is very extensive, and the average yield of oats is about fifty bushels to the acre: indeed on some tracts the yield is over seventy bushels to the acre. In one field of 1,200 acres the yield of wheat was fifty-two bushels per acre. Mr. Driver went with me to the Lake District. We took the rail to Kingston, a prosperous settlement on the banks of Wakatipu, a beautiful lake sixty-five miles long and five broad. The water in it is clear as crystal. It runs between two ranges of mountains called the Remarkable and the Humboldt Ranges, some of the peaks of which rise to a height of 8,000 feet. The tops of the ranges are covered with snow. The walls of the mountains seem to rise perpendicularly out of the water. It was for some time supposed that this lake was so deep that its bottom could not be found; but such is not the case. Its greatest known depth is 1,462 feet. The captain of the steamer "Mountaineer," which plies between Kingston and Queenstown, informed me that on one occasion he let out 1,400 feet of chain without touching bottom. The lake is fed by mountain streams, and is consequently very cold.

Beyond Wakatipu are the famous lakes Wanaka and Hawea, the scenery of which is as romantic and beautiful as that in any other part of the world. The waters are skirted by undulating terraces covered with luxuriant verdure. The mountains are not so majestic as those of Wakatipu; but some of them are very grand and are covered with craggy glaciers. On one of the mountains is a beautiful silver stream called Minaret Creek, which falls over the top into a magnificent torrent shaped like the letter V.

While returning to Auckland I touched at Napier, where I found many elements of prosperity. I left Napier by steamer in the evening, and arrived at Gisborne the following day. I drove out to the petroleum-oil springs, about twenty miles from that town. Several companies have been organized for working these springs and boring for oil, but as yet they do not appear to have met with any great success.

There appear to be three distinct kinds of petroleum in New Zealand, and while at Gisborne I was fortunate enough to obtain samples of each kind. The first sample is from the Sugarloaves, in the Taranaki District. This oil has a very high specific gravity, ·960 to ·964 at 60° Fahr., water at 1. It has too much carbon ever to become profitable, although it is claimed by analytical chemists to be capable of producing a fine lubricating oil, and it is said to resemble the oil found in Santa Barbara County, California. The second variety is from Poverty Bay, on the east coast of the Auckland District. This is said to be a true paraffine oil, resembling the Canadian oil, and, by three successive distillations and treatment with acids and alkalies, about 65 per cent. of good illuminating oil is obtained, with specific gravity of ·843. The third kind is found at Manutahi, Waipu, East Cape. This produces a pale-brown oil, nearly transparent, specific gravity of ·829, at 60° Fahr., and burns well in a kerosene lamp. It is described as being of a very superior class. It contains traces of paraffine, and produces 84 per cent. of illuminating oil fit for use in kerosene lamps by means of a single distillation.

After leaving Gisborne I returned to Auckland, and arrived there having travelled a distance of over 3,000 miles, and sailed around the greater part of the Islands.

## FINANCIAL STATISTICS.

Gold was discovered in New Zealand long before the Islands were annexed to the British Empire. The American whalers who visited these shores in 1788 reported the existence of gold in the Thames District, and Gräffe, the traveller, confirmed their accounts in 1830. Between 1830 and 1840 small quantities of gold were shipped from the Thames District. It was not, however, until 1857 that gold became an article of export. At that period, and for some years afterwards, an export duty of 2s. 6d. or 60 cents an ounce was charged on it. The duty was changed by Act of Parliament, October, 1872, which is still in force, to 2s. (48 cents) per ounce. The total quantity of gold exported from New Zealand since the 1st April, 1857, amounted to 10,020,993 ounces, of the value of £39,250,215, or $188,401,051. Herewith is a table showing the quantity and value of gold exported from New Zealand for each year since 1857:—

| Year. | Quantity. | Value. | |
|---|---|---|---|
| | Oz. | £ | $ |
| 1857 ... | 10,436 | 40,442 | 194,121·6 |
| 1858 ... | 13,533 | 52,443 | 251,726·4 |
| 1859 ... | 7,336 | 28,427 | 136,449·6 |
| 1860 ... | 4,538 | 17,585 | 84,408·0 |
| 1861 ... | 194,234 | 752,657 | 3,612,753·6 |
| 1862 ... | 410,862 | 1,591,389 | 7,638,667·2 |
| 1863 ... | 628,450 | 2,431,723 | 11,672,270·4 |
| 1864 ... | 480,171 | 1,857,847 | 8,917,665·6 |
| 1865 ... | 574,574 | 2,226,474 | 10,687,075·2 |
| 1866 ... | 735,376 | 2,844,517 | 13,653,681·6 |
| 1867 ... | 686,753 | 2,700,275 | 12,961,320·0 |
| 1868 ... | 637,474 | 2,504,326 | 12,020,764·8 |
| 1869 ... | 614,281 | 2,362,995 | 11,342,376·0 |
| 1870 ... | 544,880 | 2,157,585 | 10,356,408·0 |
| 1871 ... | 730,029 | 2,787,520 | 13,380,096·0 |
| 1872 ... | 445,370 | 1,730,992 | 8,308,761·6 |
| 1873 ... | 505,337 | 1,987,425 | 9,539,640·0 |
| 1874 ... | 376,388 | 1,505,331 | 7,225,588·8 |
| 1875 ... | 355,322 | 1,407,770 | 6,757,296·0 |
| 1876 ... | 318,367 | 1,268,559 | 6,089,083·2 |
| 1877 ... | 366,955 | 1,476,312 | 7,086,297·6 |
| 1878 ... | 311,437 | 1,244,190 | 5,972,112·0 |
| 1879 ... | 284,100 | 1,134,641 | 5,446,276·8 |
| 1880 ... | 303,215 | 1,220,263 | 5,857,262·4 |
| 1881 ... | 250,683 | 996,867 | 4,784,961·6 |
| 1882 ... | 230,893 | 921,664 | 4,423,987·2 |
| 1883 | | | |

The amount of gold produced by the mines of New Zealand for the year ended the 31st December, 1883, is set down in the Government returns at 248,374 ounces, valued at £993,352, or $4,768,090. The amount of gold actually exported in 1882 was 230,893 ounces, valued at £921,664, or $4,423,987. The amount of silver exported, the produce of the mines of New Zealand, during the same period, was 5,694 ounces, valued at £1,286, or $6,172. The above figures are partly estimated, the estimate being formed from the quantity and value entered at the Customs for duty on exportation. This estimate should, however, be regarded as a just one, as all the gold produced in the colony is exported, except a very small quantity used in the local manufacture of jewellery, and it is believed that the actual quantity used in manufacturing jewellery here would not exceed 10,000 ounces per annum.

No gold or silver is coined in New Zealand, as no branch of the Royal Mint has been established here. The only Mints in the Australasian Colonies are at Sydney, New South Wales, and at Melbourne, Victoria. These Mints issue gold coin only; the silver and bronze coin being obtained from England. On several occasions a desire has been expressed in Parliament to have a branch of the Royal Mint established in New Zealand, notwithstanding the expense it would probably be to the colony. The branch Mint at Sydney is said to be self-sustaining, but the one at Melbourne is conducted at an annual loss to the people of Victoria. It is generally admitted, however, that the establishment of a Mint in New Zealand would have the effect of raising the price of gold paid to the miners.

The value of gold coin imported into New Zealand during the year ended the 31st December, 1882, was £186,500, or $895,200. The value of the export of gold coin during the same period was £255,029, or $1,224,139. No gold bullion was imported during the year 1882. The value of gold bullion exported during the same period was £921,664, or $4,423,987. The value of silver coin imported into New Zealand during the year 1882 was £78,820, or $378,336. The value of silver coin exported during the same period was £7,514, or $36,067. No silver bullion was imported during the year 1882. The value of silver bullion exported during the same period was £1,286, or $6,172.

A novel feature in the history of the export of New Zealand gold is its recent direct shipment to the United States. The gold which hitherto reached America from this colony was sent by way of London. The first direct shipment occurred in the month of December, 1881, and this shipment has been followed up by others ever since. This gold is intended to pay for American products purchased in England. The gold reserve of the Bank of England is gradually becoming smaller; and, should there be an increase in American exports and a decrease in the imports, the flow of gold will continue in the direction of the United States. The shipment of Australasian gold to America is another illustration of the law of commerce, that all commodities tend, sooner or later, to find their way to the point of consumption by the most direct route. The value of gold exported from New Zealand to the United States during the year 1882 was £269,843 ($1,295,246), against £172,380 ($827,424) for 1881, showing an increase of £97,463 ($467,822) over the previous year.

The following table shows the composition of New Zealand gold exported from the various districts of the Colony of New Zealand:—

*Melted Gold from Hokitika, District of Westland*

| | | | Oz. | dwt. | gr. |
|---|---|---|---|---|---|
| Assay—Gold ... | 9·627 | = fine gold ... | 9 | 14 | 16 |
| Silver ... | 0·363 | | | | |
| Copper... | 0·010 | | | | |

Weight, 10 oz. 2 dwt. 6 gr.

*Melted Gold from Thames, District of Auckland.*

| | | | Oz. | dwt. | gr. |
|---|---|---|---|---|---|
| Assay—Gold ... | 6·565 | = Fine gold ... | 6 | 12 | 18 |
| Silver ... | 3·390 | = Silver ... | 3 | 8 | 13 |
| Copper... | 0·045 | | | | |

Weight, 10 oz. 2 dwt. 6 gr.

*Refined Gold, as extracted by the Chlorine Refining Process, and exported by the Bank of New Zealand, Auckland.*

| | | | | Oz. | dwt. | gr. |
|---|---|---|---|---|---|---|
| Assay—Gold | ... | 9·942 | = Fine gold ... | 9 | 19 | 20 |
| Silver | ... | 0·058 | | | | |

Weight, 10 oz. 1 dwt.

With regard to silver the produce of New Zealand, I will mention that, although various silver mines exist in the colony, not one of them has ever been successfully worked. The silver produced here is combined with gold, and obtained during the process of refining and preparing the latter metal for market. A few years ago, Mr. Miller, one of the officers of the branch of the Royal Mint at Sydney, discovered a more expeditious and economical method of refining gold and silver than that which had hitherto been in use. He had so far perfected his invention that he succeeded in obtaining letters patent for it in several of the colonies. The Bank of New Zealand, being impressed with the very great value of the invention, purchased the right to use it. The bank has derived very great advantage from this patent, for, through it, it is not only enabled to prepare its own gold for the market, but to give a better price for the ore than the other banks, who, without this patent, or some similar process, are obliged to send all their unrefined gold to the Mint either at Sydney or Melbourne. The Miller process, besides being an economical and simple one, saves all the silver combined with the gold, and destroys the baser metals.

Much of the gold found in the Thames District is combined with silver, the ore usually yielding about 30 per cent. of the latter metal. Dr. Hector, the Colonial Geologist, reports that within the last few years several mines have been opened where the ore is argentiferous galena, that yields 20 to 50 ounces of silver to the ton. In some cases the silver is mixed with iron pyrites that yield a fair percentage of gold. A mine has also been discovered at Richmond Hill, District of Nelson, where the ore is in the form of tetrahedrite, a mixed ore containing silver, antimony, zinc, bismuth, and copper, the silver being from 20 ounces to 1,792 ounces per ton. The following is an analysis of this ore:—

*Analysis of Silver Ore found at Richmond Hill, District of Nelson.*

| | |
|---|---|
| Sulphide of lead ... ... ... | 36·12 |
| „ antimony ... ... ... | 22·20 |
| „ bismuth ... ... ... | Traces. |
| „ copper ... ... ... | 19·31 |
| „ iron ... ... ... | 13·59 |
| „ zinc ... ... ... | 5·87 |
| „ silver ... ... ... | 2·39 |
| Oxide of manganese ... ... ... | ·52 |

A discovery recently made in the range between Ohinemuri and Te Aroha, a part of the Thames Gold Field District, may have an important bearing on the future production of silver in this colony. A piece of quartz from there was shown me which upon assay was found to contain 81 ounces of gold and 1,225 ounces of silver to the ton of stone. The miners have great faith in finding the rock rich in silver. The most valuable silver mines, however, that have been discovered in New Zealand are located in what is called the King country, but the Maoris, or aboriginal inhabitants, have hitherto refused to allow them to be worked. The proposition now being discussed by the New Zealand Government, to construct a railway through that country, will, when carried out, open up for settlement that part of the North Island which has long been regarded by both the Natives and Europeans as richer in mining treasures than any other in the colony.

There is no coin or money of any kind on deposit in the New Zealand Treasury. All payments are made through the Bank of New Zealand, the leading bank of the colony, and the one intrusted with the business of the Government. The Bank of New Zealand obtained the Government account as far back as 1862. The account had previously been kept by the Union Bank of Australia. It was urged that it was the duty of the Government to favour a New Zealand institution; that no foreign bank would study so well the interest of the colony. It was also argued that a branch of any foreign bank would of necessity be made to feel the effects of financial pressure in the country where the main bank was located, and that accommodation would be given or rejected, not according to the requirements of the New Zealand patrons of the bank, but in accordance with the bank's engagements and interests elsewhere. The Government account was therefore transferred to the Bank of New Zealand, which has managed to keep it ever since.

The gold and silver coin are not shown separately in the Government returns, but the amount of coin in the banks at the close of the year 1882 was £1,685,180, or $8,088,864. This amount was distributed as follows amongst the various banks doing business in the colony, viz.: Bank of New Zealand, £614,355, or $2,948,904; Union Bank of Australia (Limited), £318,008, or $1,526,438; Bank of New South Wales, £314,473, or $1,509,470; Bank of Australasia, £126,646, or $607,901; National Bank of New Zealand (Limited), £204,729, or $982,699; Colonial Bank of New Zealand, £106,967, or $513,442. The amount of gold and silver bullion in the banks in December, 1882, was £171,847, or $824,866.

It would be difficult to form a just estimate of the amount of silver in the banks and in circulation in New Zealand, as the returns do not show each kind of coin separately, but include all under the general head of coin.

There is no Government paper currency in circulation in New Zealand. The paper money is issued by the various banks of the colony. Their notes, however, cannot circulate outside New Zealand, and have to pay a tax to Government of 2 per cent. per annum on the amount issued. The paper money outstanding in the colony at the close of the year 1882 was £967,061, or $4,641,893. Of this amount, the Bank of New Zealand had £492,150, or $2,362,320; Union Bank of Australia (Limited), £112,722, or $541,066; Bank of New South Wales, £82,441, or $395,717; Bank of Australasia, £64,540, or $309,792; National Bank of New Zealand (Limited),

£112,589, or $540,427; Colonial Bank of New Zealand (Limited), £102,616, or $492,557.

There were no laws passed during the year 1883 directly affecting the coinage or legal-tender character of the metallic and paper circulation of New Zealand.

## REVENUE AND EXPENDITURE.

At the end of March, 1883, the gross indebtedness of the colony on account of loans was £30,357,111 or $145,714,133, subject to a deduction of £2,571,829 or $12,344,779 for sinking funds that have accrued. The total expenditure up to the 31st March, 1883, out of the Public Works Fund, amounted to £19,054,018 or $91,459,286. Prior to 1870, the year in which the public-works and immigration policy was initiated, the indebtedness of the colony was only £7,360,616, or $35,330,957. Under the immigration and public-works system the sum of £19,700,000 or $94,560,000 has been borrowed. Bills were passed during the session of 1882 authorizing loans amounting to £4,000,000, or $19,200,000: £3,000,000 or $14,400,000 for railways and public works, and £1,000,000 or $4,800,000 for the North Island Trunk Railway. It was provided that this money should be only raised at the rate of £1,000,000 or $4,800,000 a year upon the works specified in the Schedule to the Act, namely, to complete works already partly constructed. The first million of this loan was easily obtained in London at a low rate of interest—4 per cent. The revenue for the year ending the 31st March, 1883, was £3,742,555, or $17,964,264. Of this amount, £1,494,463 or $7,173,422 was received at the Customs, £954,740 or $4,582,752 from the railways, £444,389 or $2,133,067 from stamps, £93,135 or $447,048 telegraphic revenue, and the remainder from property-tax, land sales, &c. The revenue during the year exceeded the expenditure by £122,113, or $586,142. The public debt of the colony is certainly very large, but it must be borne in mind that the greater part of it was incurred in the construction of railways, telegraphs, and other public reproductive works which are owned and managed by the Government. The railways opened, besides developing the resources of the country, are now paying nearly 3½ per cent. on the amount expended in their construction.

So much has lately been said about the large public debt of this colony that I cannot do better than give the following extracts from the Financial Statement of the Colonial Treasurer in the House of Representatives on the 27th June, 1883:—

"It will not be necessary to trouble honourable members at any great length, as the form of our Public Accounts now permits a clear statement of our monetary transactions and position to be made within reasonable compass.

"I follow the usual and most convenient course in considering, first,—

### "THE EXPENDITURE OF THE ORDINARY REVENUE OF THE YEAR 1882–83.

"The expenditure for the year sanctioned by Parliament was £3,694,218; the total actual expenditure proved to be £3,638,384, being £55,834 less than estimated. The only item in this expenditure which calls for special remark is that of Defence. The total cost of this service has been paid out of the ordinary revenue without any contribution in aid from loan; but the principle of paying the whole cost of the armed forces of the colony out of revenue has so much to commend it that I hope Parliament will not again consent to charging any part of that cost against loan.

"With regard to railways, the amount expended was only slightly in excess of the vote, notwithstanding a very considerable increase of traffic during the year.

### "LIABILITIES OUTSTANDING ON 31ST MARCH, 1883.

"The outstanding liabilities of the Ordinary Revenue Account on the 31st March, 1883, were estimated at £176,530. These liabilities are included in the estimated expenditure for the current year. The liabilities outstanding on the 31st March, 1882, amounted to £164,394; at the close of the previous year they amounted to £165,514. It will thus be seen that, in the ordinary course of things, the liabilities on this account from year to year may fairly be estimated at from £160,000 to £180,000. The practice, begun in 1880–81, of making the payments within the financial year the expenditure of the year, without regard to date of service or supply, has greatly simplified the public accounts, and has worked satisfactorily.

### "ORDINARY REVENUE OF THE YEAR 1882–83.

"The estimated revenue for the year, exclusive of the cash derived from land sales, was £3,393,500. The actual amount paid into the Public Account, after deducting refunds, was £3,470,250, being £76,750 in excess of the estimate.

"The only class of revenue which fell short of the amount estimated was Customs, the receipts being £1,494,463 as against an estimate of £1,500,000, or £5,537 less than estimated. The total amount yielded in excess of the estimate by the other classes of revenue was £82,287. Of this sum £23,690 came from registration and other fees. The revenue from stamps was £10,389 in excess of the estimated amount. Included in this class are the duties under the Stamp Act, postal revenue, fees and fines of the law-courts, and land transfer fees, for all of which there is now only one description of stamp in use. The Treasury is consequently unable to apportion the moneys received from sales of stamps to the classes of revenue to which they relate. The same course—that of permitting one kind of stamp to be used for all purposes—has been followed to some extent in other colonies and in England, and no practical inconvenience has resulted, while to the public the change has been a great advantage. The telegraph revenue was £8,135 in excess of the estimate. The receipts from depasturing licenses, rents, &c., were also in excess £10,073. The railway receipts, notwithstanding the large reductions in the tariff, yielded more than the estimate by £14,740. This has been due to a considerable increase in the passenger traffic, and in the tonnage of goods carried, and to an unprecedented increase in the quantities of live stock moved, the latter result being doubtless due, to a large extent, to the activity of the new refrigerating industry. The previous bad season led to a somewhat diminished grain traffic during the year. The traffic arising from the last grain season chiefly falls in during the current year, so that we have not yet realized the results.

### "Land Fund, 1882–83.

"The total amount expended during the year out of moneys derived from sales of land was £197,101. The amount estimated to be expended was £236,837.

"The receipts from sales of land amounted to £272,305, consisting of £225,858 from sales for cash and £46,447 from sales on deferred payments. The total amount estimated to be received was £354,000; the receipts, therefore, fell short of the estimate by £81,695.

### "Public Works Fund.

"The appropriations granted out of the Public Works Fund for the year ended 31st March last amounted to £1,727,729, exclusive of the vote for land purchases, £82,455; the actual expenditure was, however, only £867,194, exclusive of £29,843 for land purchases. The principal items of this expenditure were—railways, £435,529; roads, £210,605; public buildings, £153,071; and other services, £67,989. A good deal of misapprehension appears to exist in the country as to the reason for the great difference between the amount voted and that spent upon Public Works, the Government often being blamed, on the one hand, for asking for votes for very much larger sums than it is intended to expend, and, on the other hand, for not spending within the year the whole of the sums voted. It is practically impossible that the periods of execution of large works should be adjusted exactly or even very closely to the periods of the votes. These latter are, in fact, authorities for the payments of the year, and for engaging the colony in operations which must extend beyond the year, and the engagements of one year become, in part, necessarily and properly, expenditure of the next and following years; and the only means by which Parliament can obtain practical control over the expenditure is by voting such a sum in respect of such works as it may determine shall be undertaken as will cover not only the probable expenditure within the year, but liabilities incurred under contracts or engagements which may remain uncompleted at the end of the financial year. The liabilities outstanding at the end of the year, exclusive of those for land purchases, amounted to £861,861, which, added to the amount expended, £867,194, gives a total of £1,729,055, as against £1,727,729 voted for the year.

"In speaking of the expenditure out of the Public Works Fund and the outstanding liabilities at the close of the year, I expressly excluded the expenditure and liabilities in respect of land purchases, because I think it is desirable to keep the liabilities on account of land purchases entirely distinct from the other liabilities of the Public Works Fund, as they stand on an entirely different footing.

"The land purchase liabilities on the 31st March last amounted to £309,299; at the close of the previous year the amount was

£338,876. No new liabilities have been incurred on this account; and, as already stated, the amount expended last year was £29,843 out of a vote for £82,455, the difference between the amount voted and the expenditure being attributable to the non-completion last year of the purchase of a large block of land in the Hawke's Bay District.

### "THE PUBLIC DEBT.

"On the 31st March, 1882, the gross public debt of the colony amounted to £29,946,711, subject to a deduction of £2,266,418 for accrued sinking funds. On the 31st March, 1883, the debt was £30,357,111, and the sinking funds had increased to £2,571,829, the net debt being thus £27,785,281, or £104,989 more than it was in the previous year.

### "LOAN OF £1,000,000 RAISED IN JANUARY, 1883.

"The loan was issued in the form of a 4 per cent. Inscribed Stock, and it was offered to the public by the Loan Agents, through the Bank of England, at a minimum of £98 10s. per cent., the average price at which it was placed being £98 12s. 5d. The stock is now quoted at 102½.

"On no previous occasion has a New Zealand loan been raised at a price so favourable to the colony. Prior to the loan being offered to the public full information regarding the progress and prospects of the Australasian Colonies in general, including New Zealand, was published in London by the Agent-General, in a very able paper read at the Colonial Institute, and fully discussed in the public Press. Not only the favourable rate, therefore, at which the loan was placed, but the present price of our 4 per cent. inscribed stock and other loans, show that there is in the money market of the world confidence in the resources of the colony, and in its ability to meet the charges of its public debt. So long as our finance is prudently managed, and the affairs of the colony are so conducted so as to promote settlement on its lands and the development of local industries, there is no reason to doubt that our credit will be well maintained, and that we shall be able to obtain from time to time, upon reasonable terms, such moneys as may be required to carry on our public works.

### "SAVINGS-BANKS AND THE GOVERNMENT INSURANCE DEPARTMENT.

"I here refer very briefly to the growth of business during the past year in connection with savings-banks and life insurance, as affording a very fair criterion of the continued improvement which is taking place in the cultivation of habits of economy and prudence amongst the people.

"In the savings-banks of the colony on the 31st December, 1881, the amount held in deposit was £1,549,515, at credit of 61,054 accounts, or an average of £25 7s. 7d. for each account; on the 31st December, 1882, the amount was £1,832,047, at credit of 68,358 accounts, the average amount being £26 16s. There was thus an increase of £282,533 in the deposits at the close of the year 1882, and 7,304 in the number of accounts open. Of the large amount of £1,832,047 accumulated in the savings-banks of the colony, £1,470,950 was deposited in the Post-Office Savings-Bank.

"Considerable attention has been bestowed on the work of the Insurance Department in the direction of extending its usefulness, and especially in bringing its benefits more readily within the reach of those who may desire to insure for small amounts. The results have been very satisfactory: the new business now exceeds a million sterling per annum, being double the average amount hitherto annually attained. The accumulated funds of the department now amount to more than three-quarters of a million. These figures appear to denote that a growing section of the general public possess the means and the desire to make prudent provision for the future, and are availing themselves of the advantages which the department offers.

### "LOCAL FINANCE.

"The passing of the Roads and Bridges Construction Act has enabled the local bodies to begin many useful works; but, owing to the fact that the money for the construction of main roads was not available until about February, the work completed under the provisions of the Act has been less than would have been the case had the money been available in the spring of the year. The amount available for construction of main roads was estimated at £200,000, but applications to the extent of £640,358 were received, the result being that the applicants were allotted only three-eighths of the amount of their applications, the Act providing that should a larger amount be applied for than was available the grants should be reduced *pro rata*. The applications for District Roads only amounted to £61,795, so that the whole of those applications which were in proper form and received the approval of the ratepayers were granted. The Act seems to be working on the whole well, but will probably require some amendment in the direction of limiting the amount which any local body may apply for.

### "FINANCIAL RESULTS OF THE YEAR.

"The total expenditure out of the ordinary revenue of the Consolidated Fund was £3,638,384, and the revenue amounted to £3,470,250. To the revenue add £203,683,—that sum being the balance standing to the credit of the account on 31st March, 1882,—and we thus obtain £3,673,933 as the total receipts of the year. Deducting from this total the expenditure, a balance of £35,549 is obtained as the surplus with which the year 1882–83 terminated. This result is very satisfactory, especially when it is remembered that taxation was remitted last year to the extent of about £80,000; while, for Constabulary, £75,000 was charged against revenue which before had been borne upon loan; and extra charges for education and interest had to be provided, to the extent of about £96,500. During the past year we contributed out of revenue not less than £270,000 to the sinking funds for the redemption of our public debt. I do not mention this sum as an exceptional charge on the revenue of the past year, but I refer to the fact for the purpose of drawing attention to the large and annually-increasing sum which the colony is periodically setting aside for the cancellation of its public indebtedness.

"The *total* revenues received, *including proceeds of land sales* and *the balances with which we began the year*, amounted to £3,957,599; and the total expenditure, including charges against the proceeds of land sales, was £3,835,486, thus showing a surplus *upon the whole transactions* of the Consolidated Fund for the year of £122,113.

### "STATE OF TRADE.

"I take for examination the three quinquennial periods beginning with the year 1868 and ending with 1882. I find that, from year to year, the fluctuation of both imports and exports is only such as might be reasonably expected in so young a colony, while making the large expenditure upon public works which has been going on for the last ten years.

"The rapid and, on the average, steady increase in the imports is not more than might have been anticipated from the impetus given to settlement and speculation by the introduction of the Immigration and Public Works scheme. The value of the imports for the period ending 1872 was £23,822,033; for the period ending 1877, £36,494,260; and for the period ending 1882, £39,358,574: giving a grand total for the fifteen years of £99,674,867. Of this total probably about £35,500,000 represents capital for which we have to pay interest to persons not resident in the colony. We may divide this gross amount as—money borrowed by the State and municipal bodies about £25,000,000, and by private persons about £10,500,000,—the whole for the development of our resources. The balance, after deduction of the amounts thus borrowed, is £64,174,867, being the payment we receive for our exports, and the value of the personal property imported by the settlers, which has not to be paid for, being their own.

"The value of the exports for the period ending 1872 was £23,949,563; for the period ending 1877, £28,691,204; and for the period ending 1882, £30,830,392: making a total of £83,471,159. Deducting this sum from the value of the imports just given, we find that the value of our imports during the fifteen years under consideration was £16,203,708 more than the value of our exports. Now, if it is true that, of our total imports, £35,500,000 worth was the property of non-residents—or, in other words capital sent here for investment—it will be seen, if we take this amount from the total value of our imports, viz., £99,674,867, that the value of the imports for which we paid from our own resources was only £64,174,867. Our exports, however, were worth £83,471,159; so that we have paid for interest, during the last fifteen years, to non-residents the difference between these sums—£19,296,292—in addition to that portion of the value of our imports which represents capital introduced and owned by our own settlers, which may be estimated at about £6,000,000. Thus we have paid for interest outside the colony about £25,296,292 in the fifteen years between 1868 and 1882, or an average, in round numbers, of nearly £1,700,000 a year. But if the capital borrowed is being employed to advantage, as we have good reason to suppose, it is clear that the transaction must be a profitable one for the colony; for, although it is true that we are sending away a large portion of our produce in payment for the use of this money, it is evident that it would be impossible for us to export anything like the quantity of produce we do without its aid.

"The practical question, then, for our consideration is—Are we producing enough to pay our debts, to live comfortably, and gradually to increase our capital? Now, in order to answer this question, it will be necessary to analyse the figures which I have given relating to our exports. We want to see if, as a people, we are directing our attention to the development of those industries which will enable us to increase our exports in proportion to the wants and increase of our population; and, to do this, the best plan will be to eliminate for the present both gold and wool from our inquiry. Out of the total export of £83,471,159, no less than £24,680,658 was for gold, and £40,339,981 for wool, or a total for gold and wool of £65,020,639. Now, the alluvial gold industry, although it was at one time the principal production of the colony, stands upon quite a different footing from either agriculture or manufactures. Alluvial diggings can only be of short duration in such a country as this, and, as a matter of fact, we find that the produce of gold has gradually fallen off from £2,492,793, in 1868, to £921,644, in 1882. Of the amount exported last year about one-third was the produce of quartz-reefing. There is good reason to expect in the future a considerably larger yield of gold from quartz-reefing than has hitherto been obtained; but, judging by the gradual falling-off for many years past of the produce of the alluvial fields, we cannot rely upon maintaining our gold export at more than the average of the last three years—that is, at slightly over one million a year. The export of gold for the first period was £11,517,655; for the second, £7,645,396; and for the third, £5,517,607. Eliminating, then, the gold export, we find the exports for the three periods which we are considering to be £12,431,908, £21,045,808, and £25,312,785 respectively, or a total of £58,790,501, of which wool contributed £8,735,785, £15,987,346, and £15,616,850, or a total of £40,339,981. From this we see that the value of our exports of wool rose rapidly during the second quinquennial period—nearly doubling—but that it slightly decreased in the last quinquennial period: not so, however, I am glad to say, the quantity or quality, the decline in value being due to the fluctuations of the market. This industry is gradually changing its character, the production of wool by small farmers now being very considerable, and likely greatly to increase. The importance to the colony of the wool industry cannot well be exaggerated, for we may be said to have paid the whole of the interest due to outside creditors out of wool during the last fifteen years, and to have received in addition a balance of about one million a year for expenditure within the colony as its result. If we now also deduct our wool export from our total, we find that the exports other than wool or gold during the period ending 1872 were in value £3,696,123; during the period ending 1877, £5,058,462; and during the period ending 1882, £9,695,935. From this we see that the value of our exports other than gold and wool has very largely increased during each period, and was, for the five years ending in 1882, nearly three times as much as for the period ending in 1872, while our population had only about doubled in the time, and the proportion of male adults to the whole population had fallen from 35·4 to 28·8 per cent. The value of exports per male adult, after eliminating gold and wool, has been, for the three periods under consideration, £8 10s. 2d., £9 5s. 7d., and £14 6s. 8d. This is a very satisfactory result, and our satisfaction is increased when we come to examine in more detail the progress of the industries which have produced this result. We find large and steady advances in the export of grain, flour, gum, leather, potatoes, sheepskins, tallow, and sawn timber; and last year there is entered for the first time amongst our exports a new industry which promises to be of the greatest advantage to the community. I refer to the export of frozen meat and dairy produce. This trade, as soon as it can be fully organized, should enable us to bring into profitable cultivation a much larger area of land in proportion to our population than we can use at present for mixed farming. Nor must we forget that we have, among others, fully established woollen mills, soap and candle factories, clothing factories, boot and shoe factories, iron foundries, tanneries, and agricultural-implement factories, which will tend either to increase, proportionately, our exports, or, by reducing our imports, to liberate an equivalent part of our exports for payment to outside creditors. For these reasons we may safely conclude that we are not only giving our attention to necessary industries, but that they have been already permanently established.

"But, notwithstanding the fact that these results are most satisfactory, as showing that we are rapidly developing industries which will bear almost unlimited expansion, we must not forget the present in the prospect of the future. For, although we have begun in earnest to develop those industries which are most essential if we are to prosper, it is nevertheless also true that, taking our total exports, including wool and gold, the value of exports per head of the male adult population has, for the three periods we are considering, steadily diminished. The exports were £55 2s. 5d. for the first period, £52 13s. 9d. for the second, and £45 11s. 5d. for the third per head respectively. Now, these figures, if taken alone, would give a very erroneous impression of what is really going on with regard to production in the colony, and they would have a very serious aspect indeed if our exports other than wool and gold had not both steadily and largely increased during the same period. But fortunately the exports other than wool and gold have largely increased, as I have already shown, from £8 10s. 2d., in 1872, to £14 6s. 8d., in 1882, per head of the male adult population.

"We have paid annually on the average, for interest outside the colony, during the last fifteen years, nearly £1,700,000; but it must be borne in mind, in considering our present position, that we are now paying not less than £2,500,000 a year for interest to non-residents. In other words, rather more than one-third of our exports do not belong to us—that is to say, they have to go to pay our debts abroad, and bring us no return whatever, except the difference between the interest we pay for the use of our borrowed money and the profit we make by its use, which is probably not more than 2 per cent. directly for that privately borrowed, although the indirect gain must be considerably more both upon the public and private borrowing.

"We are now in a position to understand pretty well the meaning of what is going on around us with regard to trade and money, so far as these matters are governed by what we do here.

"Now, the first thing that strikes us is the curious coincidence that the total amount of interest and sinking fund, so far as can be estimated, which we have paid outside the colony during the last fifteen years, is practically the same amount as the money borrowed by the colony and municipal bodies taken together. But, although this has been the case in the gross during the last fifteen years, the the case has been different for the last three years. For that period the expenditure of money borrowed by the State has not much exceeded one-half of the interest and sinking fund—amounting, as before stated, to £2,500,000—which we have to pay out of the colony for colonial and municipal loans and private indebtedness; and for the last two years it has only been a little more than one-third.

"From this it will at once be evident, assuming our exports to remain the same, that, unless a sufficiently large influx of capital, the property of settlers, is maintained to justify the continuance of our imports at their average rate, or unless the produce of our local industries supplying the colonial consumption increases to the extent of any reduction that may take place in our imports, commercial depression must follow. Now, our exports for the last three years have been—£6,352,692 in 1880; £6,060,866 in 1881; and £6,658,008 in 1882: while our imports for the same years have been £6,162,011, £7,457,045, and £8,609,270 respectively. Our exports for 1880 were £6,352,692, and for 1882 £6,658,008—an increase of £305,316. Our imports for 1880 were £6,162,011, and for 1882 £8,609,270—an increase of £2,447,259.

"There is reason to believe that the introduction of capital the property of settlers was very large during last year, and to that extent the increase in our imports was legitimate; but, making every allowance for this important item, it is clear, to my mind, that our imports last year were at least £1,000,000 more than they ought to have been to supply our reasonable wants, that they have been obtained on credit, and are therefore pressing very heavily upon the commercial classes and, through them, upon the rest of the community. It is clear that until we have worked off our surplus stocks—and this can only be done by producing the means to pay for them, which will be the work of time—we cannot expect full relief from the present commercial depression, although the gradual easing of the money market in Australia as it takes place will give us some help.

"But are there any real grounds, on account of the present commercial depression which undoubtedly exists over a large part of the colony, or from any deduction which can be fairly drawn from the figures I have just given, to justify us in taking a gloomy view of our future prospects? No! I say distinctly, after a most careful consideration of the whole condition of the country, that there are not only no real grounds for taking a despondent view of our position, but, on the contrary, there is much reason to justify us in looking forward with confidence to a future of great prosperity. We, like other communities, shall have our ups and downs. Unusual prosperity will be followed by unusual depression, as is the case all over the world. No one who sees the steady improvements that are going on all over the colony, who observes the very substantial increase in the savings-banks deposit, the great increase in life-assurance business, and the rapid development of our manufacturing industries, and who has watched our import and export trade with care, can doubt that we are producing enough to pay our debts, live comfortably, and gradually accumulate capital. The present state of our trade is not satisfactory, but we might have avoided it almost entirely had our judgment been a little better. No doubt business men were tempted by cheap freight and comparatively easy money to over-import, forgetting for the moment the effect which would follow the contraction in the expenditure of borrowed money—an expenditure which Parliament has determined to keep within much narrower limits than have been observed in the past. The remedy for such a depression as we are now suffering from is in our own hands; it is old, very simple, and thoroughly effective, but unfortunately there is no royal road to it. It consists in an amount of self-denial and self-restraint of which we are somewhat impatient in these days. The remedy is to live within our means, both publicly and privately; and there are many indications that we are really making up our minds to follow the good old plan.

"In conclusion, notwithstanding the existence of some commercial depression in parts of the colony, the result of influences of which I have endeavoured to afford explanation in my previous remarks, yet the steady growth of essential industries,—the gradual improvement of our internal communications,—the rapid and spontaneous increase of commercial facilities by means of fine fleets of sailing- and steamships, which unite us with other lands and ply constantly on our coasts,—the establishment of an export trade in frozen meat and other produce of the land,—the encouragement afforded to settlement of the country in small holdings,—and the prospect of an early and complete solution of those questions which have so long delayed the reconciliation of a large section of the Native population to our rule, are considerations which justify a sober confidence in the future, and encourage the Legislature to persevere in the course which it has followed, with such advantage to the colony, of a careful and methodical finance,—of a just and firm but conciliatory Native policy,—and of the settlement of the land in such holdings as will promote its occupation by the people."

TABLE showing the VALUE of WOOL, GOLD, GRAIN, KAURI GUM, TALLOW, and SAWN TIMBER exported from the Colony in each Year from 1868 to 1883.

| Year. | Wool. | | Gold. | | Grain. | | Kauri Gum. | | Tallow. | | Sawn Timber. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ |
| 1868 .. | 1,516,548 | | 2,492,793 | | 114,468 | | 72,493 | | 3,288 | | 7,878 | |
| 1869 .. | 1,371,230 | | 2,341,592 | | 96,441 | | 111,307 | | 13,935 | | 14,849 | |
| 1870 .. | 1,703,944 | | 2,163,910 | | 141,135 | | 175,074 | | 75,583 | | 11,137 | |
| 1871 ... | 1,606,144 | | 2,788,368 | | 164,494 | | 167,958 | | 67,208 | | 14,200 | |
| 1872 .. | 2,537,919 | 8,735,785 | 1,730,992 | 11,517,655 | 178,965 | 695,503 | 154,167 | 680,999 | 68,788 | 228,802 | 19,431 | 67,495 |
| 1873 .. | 2,702,741 | | 1,987,425 | | 136,832 | | 85,816 | | 67,118 | | 27,764 | |
| 1874 .. | 2,831,696 | | 1,505,331 | | 291,112 | | 79,986 | | 65,366 | | 33,410 | |
| 1875 .. | 3,398,155 | | 1,407,769 | | 231,457 | | 138,523 | | 55,865 | | 16,096 | |
| 1876 .. | 3,395,816 | | 1,268,559 | | 338,792 | | 109,234 | | 109,896 | | 33,726 | |
| 1877 .. | 3,658,938 | 15,987,346 | 1,476,312 | 7,645,396 | 277,453 | 1,275,646 | 118,348 | 531,907 | 156,552 | 454,797 | 26,006 | 137,002 |
| 1878 .. | 3,292,807 | | 1,244,192 | | 508,981 | | 132,975 | | 178,502 | | 28,982 | |
| 1879 .. | 3,126,439 | | 1,134,641 | | 561,134 | | 147,535 | | 145,595 | | 18,782 | |
| 1880 .. | 3,169,300 | | 1,220,263 | | 906,870 | | 242,817 | | 146,535 | | 40,321 | |
| 1881 .. | 2,909,760 | | 996,867 | | 996,503 | | 253,778 | | 120,611 | | 65,119 | |
| 1882 .. | 3,118,544 | 15,616,850 | 921,644 | 5,517,607 | 922,169 | 3,895,657 | 260,369 | 1,037,474 | 165,938 | 757,181 | 94,493 | 247,697 |
| 1883 .. | 3,014,211 | | 892,445 | | 1,286,724 | | 336,606 | | 233,557 | | 124,898 | |

TABLE showing the TOTAL VALUE of IMPORTS and EXPORTS of the COLONY in each Year from 1868 to 1883.

| Year. | Imports. | | Exports. | |
|---|---|---|---|---|
| | £ | £ | £ | £ |
| 1868 | 4,985,748 | | 4,429,198 | |
| 1869 | 4,976,126 | | 4,224,860 | |
| 1870 | 4,639,015 | | 4,822,756 | |
| 1871 | 4,078,193 | | 5,282,084 | |
| 1872 | 5,142,951 | 23,822,033 | 5,190,665 | 23,949,563 |
| 1873 | 6,464,687 | | 5,610,371 | |
| 1874 | 8,121,812 | | 5,251,269 | |
| 1875 | 8,029,172 | | 5,828,627 | |
| 1876 | 6,905,171 | | 5,673,465 | |
| 1877 | 6,973,418 | 36,494,260 | 6,327,472 | 28,691,204 |
| 1878 | 8,755,663 | | 6,015,700 | |
| 1879 | 8,374,585 | | 5,743,126 | |
| 1880 | 6,162,011 | | 6,352,692 | |
| 1881 | 7,457,045 | | 6,060,866 | |
| 1882 | 8,609,270 | 39,358,574 | 6,658,008 | 30,830,392 |
| 1883 | 7,974,038 | | 7,095,999 | |

## GENERAL STATISTICS.

The population of New Zealand on 31st December, 1882, was estimated at 517,707 persons, excluding Maoris. The number of Maoris enumerated at the census, April, 1881, was 44,097 persons. The total number of persons at the close of the year 1882 may therefore be stated at about 561,804.

Of the 517,707 persons forming the European population in December, 1882, 283,303 were males and 234,404 were females.

The increase to the population from the census, April, 1881, to 31st December, 1882, amounted to 27,774 persons. *It is certain that the further increase during the year* 1883 *will show the population on* 31*st December as exceeding* 540,000 *persons, excluding the Maoris.*

*It has been ascertained that more than* 19,000 *immigrants arrived in New Zealand during the year* 1883, *while the departures were slightly in excess of* 9,000 *persons.*

It should be a great source of pride to the people of this colony that the last census returns show a larger increase of population in New Zealand than in any other of the Australasian Colonies. The census was taken throughout Her Britannic Majesty's dominions on the 3rd April, 1881. The method of taking it, as far as New Zealand is concerned, was simply admirable. The total population of the Colony of New Zealand at the date of the census was found to be 534,030. Of this number, there were 44,097 of the Native or Maori race, 2,044 half-castes not living as members of a Maori tribe, and 5,004 Chinese.

The following table has been supplied by the Registrar-General:—

### Census of New Zealand, 1881.

| Districts. | Total. | Males. | Females. |
|---|---|---|---|
| Auckland | 99,451 | 54,111 | 45,340 |
| Taranaki | 14,858 | 8,517 | 6,341 |
| Wellington | 61,371 | 32,717 | 28,654 |
| Hawke's Bay | 17,367 | 9,700 | 7,667 |
| Marlborough | 9,300 | 5,249 | 4,051 |
| Nelson | 26,075 | 14,800 | 11,275 |
| Westland | 15,010 | 9,075 | 5,935 |
| Canterbury | 112,182 | 60,590 | 51,592 |
| Otago | 134,077 | 74,685 | 59,392 |
| Chatham Islands | 242 | 161 | 81 |
| Total, exclusive of Maoris | 489,933 | 269,605 | 220,328 |
| Maoris | 44,097 | 24,368 | 19,729 |
| Total of New Zealand | 534,030 | 293,973 | 240,057 |

The following is a list of the municipalities in the colony in 1881 with a population of 3,000 and upwards:—

| Municipalities. | Total. | Males. | Females. |
|---|---|---|---|
| Dunedin | 24,372 | 12,246 | 12,126 |
| Wellington | 20,563 | 10,226 | 10,337 |
| Auckland | 16,664 | 8,651 | 8,013 |
| Christchurch | 15,213 | 7,734 | 7,749 |
| Sydenham | 8,460 | 4,290 | 4,170 |
| Nelson | 6,764 | 3,261 | 3,503 |
| Oamaru | 5,791 | 3,007 | 2,784 |
| Napier | 5,756 | 2,896 | 2,860 |
| Thames | 4,863 | 2,538 | 2,325 |
| Wanganui | 4,646 | 2,330 | 2,316 |
| Invercargill | 4,596 | 2,373 | 2,223 |
| Lyttelton | 4,127 | 2,205 | 1,922 |
| Caversham | 3,989 | 2,061 | 1,928 |
| Timaru | 3,917 | 2,117 | 1,800 |
| Parnell | 3,529 | 1,726 | 1,803 |
| New Plymouth | 3,310 | 1,673 | 1,637 |

It will be seen from the first table that in every district the number of males is largely in excess of the females. In the European population alone there is a disparity of nearly 50,000, the exact number being 49,277. I do not think any of the other Australasian Colonies exhibit a like disproportion. For instance, in the Colony of

Victoria there are 450,287 males and 408,296 females, a discrepancy of only 41,990 amongst a much larger population. It is also singular that a marked discrepancy exists in the proportion of Maori males and females. Among the Maoris there is a deficiency of 4,639 females, so that the total deficiency of females in the Colony of New Zealand is 53,916.

The real actual and relative importance of the four princpal boroughs as centres of population is not shown, unless the immediate suburban population be included. The suburbs constitute practically extensions of the central borough, although defined as separate boroughs and Road Board districts. Including therefore the suburbs, the populations at the census stood as under:—

| | |
|---|---|
| Auckland ... ... ... ... | 30,952 |
| Wellington ... ... ... ... | 20,563 |
| Christchurch ... ... ... ... | 30,715 |
| Dunedin ... ... ... ... | 42,794 |

It is interesting to compare the progress the Colony of New Zealand is making with that of her elder sister, Victoria. In March, 1857, the total population of Victoria was 410,766, while in December, 1858, the total European population of the Colony of New Zealand was 59,413, and, if the Maori population is added, as is the aboriginal population of Victoria, the total number of human beings in New Zealand on that date would certainly not have exceeded 100,000, considerably less than one-fourth of that living in Victoria twelve months previously.

But the change which the intervening twenty-three years has worked is marvellous, although during that time the people of New Zealand have waged successfully several wars with the Natives, cir cumstances not likely again to occur to retard the progress of the colony. In spite of these wars and other obstacles to progress, during the last twenty-three years New Zealand has increased its population from being considerably less than one-fourth that of Victoria then to nearly two-thirds that of Victoria to-day. Victoria, during that period, has increased her 410,766 people by 447,816, while the island colony has increased her 100,000 by no less than 434,030. This rate of progress is decidedly remarkable, and shows that if the same rate of increase is maintained in the future the premier colony of Australasia will be passed in population and other elements of progress by her younger sister.

The increase of the population of New Zealand has been very general all over the colony, and has not been, as in Victoria and New South Wales, a growth chiefly in the towns. The population of New Zealand in 1870 was 248,400, and at the last census it was 489,933, exclusive of Maoris, showing that in little over ten years the population had nearly doubled—a fact, I think, unprecedented in the history of any other country. In New Zealand the increase was 97 per cent.; in Victoria it was only 18 per cent. In 1870 the population of New South Wales was 502,861; it is now 750,000, showing an increase of 49 per cent.: certainly a very gratifying result, but very far behind that of New Zealand. The growth of New Zealand in wealth has been commensurate with the increase of her population.

In 1870 the value of New Zealand's imports was £4,639,015, or $22,267,272; now it is £8,609,270, or $41,324,496. In 1870 the value of the exports, the produce of the colony, was £4,544,682, or $21,814,473; it is now £6,253,350, or $30,016,080. The net revenue in the years 1870 and 1871, exclusive of money derived from land sales, was £1,101,269, or $5,286,091; it is now £3,470,250, or $16,657,200.

The taxation per head is much larger in the Australasian Colonies than in the United States, but in spite of apparently excessive taxation the colonies are making rapid strides in the race of progress. The seven Australasian Colonies cover an area of 3,075,736 square miles, exceeding the area of the United States of America, and only some 700,000 square miles less than the entire area of the Continent of Europe. Scattered over this vast territory is a population of 2,936,409 people (on the 31st December, 1882), excluding the Maoris of New Zealand and aborigines of Australia; but their trade and wealth bear testimony to the richness of the lands they occupy, and their public works, their cultivations, and their flocks and herds attest their enterprise and industry.

The telegraph lines of New Zealand are in splendid working order. They are owned and managed by the Government, and the best and newest inventions are brought at once into use. The total number of messages of all codes transmitted during 1882 was 1,570,189. There were 4,011 miles of line maintained, and about 13,000 miles of wire. The telephone has also been introduced into the principal towns in the colony, and messages are conveyed at a low charge.

The following table shows the number of letters and telegrams sent, and the proportion of telegrams to every one hundred letters, in New Zealand since the year 1867:—

| Year. | Number of Letters. | Number of Telegrams. | Proportion of Telegrams sent to every 100 Letters. |
|---|---|---|---|
| 1882–83 ... ... | 14,546,748 | 1,570,189 | 10·79 |
| 1881–82 ... ... | 11,059,677 | 1,438,772 | 13·00 |
| 1880–81 ... ... | 10,895,998 | 1,058,342 | 9·71 |
| 1879–80 ... ... | 7,065,510 | 1,008,409 | 14·27 |
| 1878–79 ... ... | 7,374,786 | 1,448,943 | 19·64 |
| 1877–78 ... ... | 6,078,384 | 1,260,324 | 20·71 |
| 1876–77 ... ... | 5,540,920 | 1,124,432 | 20·29 |
| 1875–76 ... ... | 5,731,873 | 1,051,086 | 22·21 |
| 1874–75 ... ... | 4,059,517 | 917,218 | 22·59 |
| 1873–74 ... ... | 3,209,837 | 752,899 | 23·45 |
| 1872–73 ... ... | 2,828,372 | 568,960 | 19·76 |
| 1871–72 ... ... | 2,418,021 | 411,677 | 17·02 |
| 1870–71 ... ... | 2,626,974 | 312,874 | 11·91 |
| 1869–70 ... ... | 2,374,060 | 185,423 | 7·81 |
| 1868–69 ... ... | 2,749,488 | 146,167 | 6·12 |
| 1867–68 ... ... | 1,938,578 | 106,104 | 5·47 |

The following table shows the number of registered letters received in and sent from the colony during the year 1882:—

| Postal Districts. | Received. | Sent. | Totals. |
|---|---|---|---|
| Auckland ... ... ... ... | 4,642 | 15,459 | 20,101 |
| Thames ... ... ... ... | 161 | 1,136 | 1,297 |
| New Plymouth ... ... ... | 507 | 2,589 | 3,096 |
| Gisborne ... ... ... ... | 130 | 745 | 875 |
| Napier ... ... ... ... | 921 | 4,141 | 5,062 |
| Wanganui ... ... ... | 439 | 4,771 | 5,210 |
| Wellington ... ... ... | 3,137 | 15,147 | 18,284 |
| Nelson ... ... ... ... | 805 | 2,581 | 3,386 |
| Westport ... ... ... ... | 106 | 809 | 915 |
| Greymouth ... ... ... | 187 | 1,999 | 2,186 |
| Hokitika ... ... ... ... | 220 | 1,700 | 1,920 |
| Blenheim ... ... ... ... | 215 | 1,286 | 1,501 |
| Christchurch ... ... ... | 4,271 | 13,677 | 17,948 |
| Timaru ... ... ... ... | 512 | 2,853 | 3,365 |
| Oamaru ... ... ... ... | 271 | 1,712 | 1,983 |
| Dunedin ... ... ... ... | 4,217 | 13,344 | 17,561 |
| Invercargill ... ... ... | 1,484 | 5,100 | 6,584 |
| Totals ... ... | 22,225 | 89,049 | 111,274 |

As to the postal revenue of the colony, Auckland takes the lead of all the other cities. The returns from the large cities for the quarter ended the 31st December, 1882, were as follow: Auckland, £5,336, or $25,613; Christchurch, £4,797, or $23,025; Wellington, £3,114, or $14,947; and Dunedin, £5,282, or $25,353.

Auckland also takes the lead in the telegraph returns. The figures for the same quarter are as follow: Auckland, £4,545, or $21,816; Christchurch, £3,082, or $14,793; Wellington, £2,612, or $12,537; and Dunedin, £3,805, or $18,264. The following is the amount of the money orders issued for the above quarter: Auckland, £26,140, or $125,472; Christchurch, £17,061, or $81,893; Wellington, £16,730, or $80,304; and Dunedin, £21,492, or $103,161.

The number of farmers and market-gardeners in New Zealand at the last census was 19,371; farm servants and labourers, 12,544; the number of people engaged in various forms of agricultural employment, sheep-farming, &c., 54,447.

There are 64,177 persons enrolled under the head of industrial classes; commercial, 21,022. Of these, 618 are merchants, and 241 capitalists; commercial travellers and salesmen, 629; clerks, 3,428.

The total arrivals in New Zealand during the year 1882 were 10,945, and the departures 7,456, leaving a balance of 3,489 in favour of the colony. More than two-thirds of the net gain are obtained from the United Kingdom. The colony received from Australia 6,975 visitors, and returned there 6,297, a gain of 678 for New Zealand. The following shows the arrivals and departures:—

| Colonies. | Arrivals. | Departures. | Gain. | Loss. |
|---|---|---|---|---|
| Victoria ... ... ... ... | 4,046 | 3,026 | 1,020 | ... |
| New South Wales and Queensland | 2,465 | 3,081 | ... | 616 |
| Tasmania ... ... ... ... | 463 | 190 | 273 | ... |
| South Australia ... ... ... | 1 | ... | 1 | ... |
| Totals ... ... ... | 6,975 | 6,297 | 1,294 | 616 |

The arrivals from Great Britain during 1882 numbered 3,205, the departures 464. The subjoined table shows the gain by immigration and loss by emigration at the principal ports:—

| Ports. | Arrivals. | Departures. | Gain. | Loss. |
|---|---|---|---|---|
| Auckland ... ... ... ... | 3,594 | 2,067 | 1,527 | ... |
| Wellington ... ... ... | 1,004 | 1,165 | ... | 161 |
| Lyttelton ... ... ... ... | 817 | 354 | 463 | ... |
| Dunedin ... ... ... ... | 1,888 | 642 | 1,246 | ... |
| Invercargill ... ... ... | 3,344 | 2,605 | 739 | ... |

These figures will show readily the substantial elements of prosperity in the colony.

## AUSTRALASIAN BANKING.

The banking system of the Australasian Colonies bears a much closer resemblance to the Scotch system of banking than to that of England. The banks of Australasia, like those of Scotland, all have branches. The Australasian banks are nearly all banks of issue, while in England this is the exception rather than the rule. The Scotch method of making cash advances on credit is in general use here, while in England it is exceptional. In fact, overdrawn accounts in Australasia are rather encouraged by the banks than otherwise. The rate charged upon such advances is usually 1 per cent. above the maximum rate of discount. Large sums are frequently advanced on sheep and cattle, and invariably on the wool growing upon the sheep. It is said that more than two-thirds of all the debts due to the banks of Australasia, which amount to more than £75,000,000, or $360,000,000, are based directly or indirectly upon pastoral securities of some character. It is useless to find fault with this method of banking. It is a safe one, as experience has proved. Banking, like other institutions, must be adapted to the character of the country and the habits and pursuits of the people. For instance, it was not customary for banks to engage in the purchase of gold on their own account. In Australasia they found it not only necessary to do this, but to follow the fortunes of the miners and open branches in every gold-yielding district. Banks often transacted business in tents or in the frailest wooden structures, and danger was experienced in moving the capital of the bank from one place to another. The gold and notes were frequently carried about strapped to the person of the banker while on foot or horseback, and a good steed and a pair of pistols were a part of the necessary outfit of every bank manager. These precautions no longer exist, and the bank buildings of Australasia are amongst the finest in the world. Every facility is afforded here for the business of banking. There is a branch bank in every town of any size in the colonies, and in some towns of only a thousand inhabitants there are two or three.

The number of banks and branch banks of issue in Australasia is 1,076, and, as the population of the colonies exclusive of aborigines, in December, 1882, was 2,936,409, it follows that there is a bank for every 2,729 persons of all ages. In the United States, with over 50,000,000 people, there are only 2,269 banks of issue. In England there is one bank to every 11,810 persons; in Ireland, one to every 10,910; and in Scotland, one to every 4,031. The note circulation of the Australasian banks is very large. According to the last returns it was equivalent to £5,344,852, or $25,655,290, about 60 per cent. of which consisted of £1 notes, or $4 80c.

The story of the origin and progress of banking in Australasia is fraught with the deepest interest. It is one so full of risk and varying fortunes, of sudden transitions and startling contrasts, that it reads more like a chapter out of the Arabian Nights Entertainment, than a straightforward record of events that have actually occurred during the present century. The colonies themselves, with all their varied treasures, seem to have sprung into existence by magic. About a hundred years ago, shortly after the discovery of Australia, a small and feeble colony was planted on its then inhospitable shores by Great Britain, who claimed sovereignty over all its vast territory. That Government, however, had little idea of the importance of her possession, and her wisest statesmen never even dreamed of the splendour and magnificence of the destiny that awaited it. No other reason for this conclusion need be given than the fact that for some time after its discovery, Australasia (except New Zealand) was used principally, if not exclusively, for penal settlements. New South Wales was the first colony settled, and, previous to the discovery of gold in Victoria, took the lead of all the others. The country was especially adapted for pastoral pursuits, and in a short time sheep-farming became a very important industry. The early settlers were composed of people of various countries, and there was but little money in circulation, and that little was of the most mixed character. It was necessary to have some medium of exchange, and many disputes arose as to the value of the different kinds of coin that had been brought there. The Governor, in order to settle these disputes, issued a Proclamation fixing the relative value of coin in circulation. The following table shows the relative value of money in circulation in Australia in the year 1800, fixed by the Proclamation of the Governor of New South Wales:—

| Coin. | Value. £ | s. | d. | $ | c. |
|---|---|---|---|---|---|
| A guinea ... ... ... | 1 | 2 | 0 | 5 | 28 |
| A johannes ... ... ... | 4 | 0 | 0 | 19 | 20 |
| A half-johannes ... ... | 2 | 0 | 0 | 9 | 60 |
| A ducat ... ... ... | 0 | 9 | 6 | 2 | 28 |
| A gold mohar ... ... | 1 | 17 | 6 | 9 | 0 |
| A pagoda ... ... ... | 0 | 8 | 0 | 1 | 92 |
| A Spanish dollar ... ... | 0 | 5 | 0 | 1 | 20 |
| A rupee ... ... ... | 0 | 2 | 6 | 0 | 60 |
| A Dutch guilder ... ... | 0 | 2 | 0 | 0 | 48 |
| An English shilling ... ... | 0 | 1 | 1 | 0 | 26 |
| Copper coin—1 oz. ... ... | 0 | 0 | 2 | 0 | 4 |
| ,, ½ oz. ... ... | 0 | 0 | 1 | 0 | 2 |
| ,, ¼ oz. ... ... | 0 | 0 | 0½ | 0 | 1 |

The Proclamation also made copper coin a legal tender to the amount of £5, or $24, and the recipient of that sum ($24) had to carry home with him 37½ lb. weight of metal. In 1812 the population increased so rapidly that other means had to be resorted to in order to meet the want of a circulating medium. The Governor soon adopted the plan of allowing the issue of promissory notes by private individuals, payable on demand in copper coin. These notes, which were usually of a small amount, became very popular, and almost any one could issue them. It took about 2 lb. weight of metal to make the equivalent of 5s., or $1 20c. According to the Proclamation, no one was allowed to dispose of these notes at a less sum than the value on the face of them.

Mr. Edwin Brett, a gentleman who has given much study to the subject of banking, and to whom I am principally indebted for the material for this report, recently read a paper before the Institute of Bankers, in London, on the "History and Development of Banking in Australasia," in which he gives a very graphic account of these early events, and mentions the fact that the appreciation of metallic money, set forth in the Governor's Proclamation of 1800, was so extended that a Spanish dollar, worth 5s., or $1 20c., was made to do duty for 6s. 3d., or $1 50c., by the ingenious method of punching out of the centre a circular piece which was called a dump, and was valued at 1s. 3d., or 30 cents, whilst the rim, dignified by the name of a "holey" dollar, legally circulated for 5s., or $1 20c. These coins, issued in 1813, were not called in till 1829. Mr. Brett also mentions that the Bank of New South Wales was accustomed to advertise the payment of its dividends in dollars or commissariat notes at the option of the shareholders. Some of the colonies, after the discovery of gold, established mints for coining it. The coins issued by the Government of South Australia were heavier than the British sovereign, and were alloyed with silver instead of copper. The Australian coin weighed 135 grains, and the British sovereign 123¼ grains.

The colonial coinage was evidently a violation of the prerogative of the Crown; but at the time no objection was made to it by the Imperial Government, as no better expedient could have been adopted. The Australian coin bore upon the obverse side the figure of a royal crown, with the words "Government Assay Office, Adelaide, 1852," and on the reverse side was inscribed the following: "Weight 5 dwts. 15 grs., value one pound 22 carats."

The conduct of the colonial authorities in issuing this money was conceived in a far juster spirit than that which is said to have characterized the action of Mr. Samuel Forwood in the manufacture of money which he circulated some years ago in the State of Kentucky. During the early settlement of Kentucky, and indeed at a much later period, the people suffered no little inconvenience for the want of a circulating medium. The greater part of the specie in use there consisted of a very small supply of Spanish and Mexican dollars, and many of these were disfigured and mutilated, or else worn so thin that they were of much lighter weight and of less value than the authorized standards. Mr. Forwood undertook to furnish the country with a better medium of exchange. He paid frequent visits to the wild and mountainous regions of Kentucky, where he claimed to be able to find the precious metal by means of a hazel switch. That he found the metal in this way is doubtful, but it is well known that immediately after each of his periodical visits to the mountains he flooded the neighbourhood with a vast quantity of coin of his own make, which was much heavier and brighter than any in use, and which the people were glad to get, as Mr. Forwood was always perfectly prepared and willing to redeem his coin with either Mexican or Spanish money. In time curious stories were told about him. One was that he employed a Frenchman from New Orleans to manufacture the coin. They appeared to do business for a while very satisfactorily together, but soon they fell out, the Frenchman accusing Forwood of violating the contract. It was agreed, according to the statement of the Frenchman, that Forwood should furnish 25 cents' worth of pure silver for every dollar made. This agreement proved unsatisfactory to Forwood, who, as the Frenchman alleged, became so mean and avaricious that he refused to furnish more than 12½ cents' worth of silver to the dollar. At this the Frenchman became very indignant, saying that, while he could make a good dollar out of 25 cents' worth of silver, no coiner on the face of the earth would undertake to make a dollar out of a "bit" (the word "bit" meaning a small coin of the West Indies, a half-pistareen, and applied in Kentucky and other States of the Union to the eighth part of a dollar).

The Government of Great Britain was so impressed with the advantages to be derived from the establishment of a mint in New South Wales, that finally, after much hesitation, they assented to a branch one being formed at Sydney under certain restrictions, amongst which was one that the coin should be legal tender only within the Australasian Colonies. This restriction was shortly afterwards removed, the Imperial Government extending the privilege to the Crown Colonies of Mauritius, Ceylon, and Hongkong. Mr. Brett says that what tended more than anything else to render the coinage of New South Wales remunerative was a regulation made in 1857 to coin the produce of other colonies at a reduced rate, and thus Victorian gold was attracted to Sydney to assist in utilizing the half-employed machinery. Subsequently, in 1872, a branch mint was established at Melbourne, in Victoria. In 1866 the Australian coin was made a legal tender throughout the British dominions. In 1871 the original design of the Australian sovereigns was ordered to be discontinued, and that used for the Imperial gold coins adopted.

In the Colony of Victoria the Government banking business is distributed amongst the ten principal banks, but in each of the other colonies the Government business is intrusted to only one bank. Interest on current accounts is discouraged, and all the banks unite together in regulating the rate of interest to be paid on fixed deposits, which seldom exceeds 5 per cent. per annum.

The growth and importance of the banking system of Australasia can be best illustrated by tracing the progress of the banks during the last decade. In the year 1872 the total assets of the banks were £48,473,000, or $232,670,400, and the total liabilities were £36,905,000, or $177,144,000. In 1882 the total assets were £104,521,286, or $501,702,172, and the total liabilities were £75,913,056, or $364,382,668, showing an increase during the ten years in the assets of £56,048,286, or $269,031,772. The bank capital employed in 1873 was £11,568,000, or $55,526,400, and in 1882 it was £28,608,270, or $137,319,596, an increase during the decade of £17,040,270, or $81,793,296.

In former reports to the Department of State I have frequently referred to the substantial elements of prosperity so strikingly exhibited in the half-yearly balance-sheets of the Bank of New Zealand, the leading bank of this colony. The Bank of New Zealand was founded in the year 1861, and has ever since that time shown an almost unexampled career of prosperity. In 1861 the nominal capital of the bank was fixed at £500,000, or $2,400,000, in shares of £10, or $48, each, to be called up as required. Ten thousand shares were reserved for London, where a local board of directors was to be appointed at an early date. Ten thousand shares were taken up at once in Auckland, representing £100,000, or $480,000. The shares allotted to Sydney were also taken up as soon as put upon the market. The first half-yearly balance-sheet showed a paid-up capital of £108,785, or $522,168. At the last half-yearly meeting in Auckland, on the 21st April, 1883, the paid-up capital was £1,000,000, or $4,800,000, and its reserve fund was £600,000, or $2,880,000. The notes in circulation in 1861 amounted to £62,914, or $301,987; they now reach the sum of £562,564, or $2,700,307. The amount of bills payable in circulation in 1861 was £6,288, or $30,182; it is now £1,889,600, or $9,070,080. The total of deposits in 1861 was £334,197, or $1,604,146; now it is £8,380,930 13s. 10d., or $40,228,467. In 1861 the profit and loss account was £6,097, or $29,265; now it is £99,451 8s., or $477,366. On the credit side in 1861 we find the coin and bullion represented at £261,512, or $1,255,257; now it is £1,157,175, or $5,554,440. In 1861 the amount of bills discounted and other debts due to the bank was £117,475, or $563,880; now it is £8,389,802, or $40,271,049. The value of the landed property of the bank in 1861 was £9,960, or $47,808; it is now £241,609, or $1,159,723. In 1861 the total transactions of the bank were £567,979, or $2,726,299; they are now £12,532,546 19s. 8d., or $60,156,224. At first the dividend of the bank was small, but in the year 1864 it rose to 15 per cent. The following is the balance-sheet of this bank (31st March, 1883, including London office 31st January, 1883) embraced in the forty-third report of the directors to the half-yearly general meeting of the proprietors held at Auckland on Friday, the 20th April, 1883:—

| *Dr.* Liabilities. | £ | s. | d. | $ |
|---|---|---|---|---|
| To Capital paid up .. .. .. | 1,000,000 | 0 | 0 | 4,800,000 |
| Reserve Fund .. .. .. | 600,000 | 0 | 0 | 2,880,000 |
| Notes in circulation .. .. | 562,564 | 0 | 0 | 2,700,307 |
| Bills payable in circulation .. .. | 1,889,600 | 17 | 10 | 9,070,084 |
| Deposits and other liabilities .. .. | 8,380,930 | 13 | 10 | 40,228,467 |
| Balance of Profit and Loss Account .. | 99,451 | 8 | 0 | 477,366 |
| | £12,532,546 | 19 | 8 | 60,156,224 |

| *Cr.* Assets. | £ | s. | d. | $ |
|---|---|---|---|---|
| By Coin and cash balances at bankers .. | 1,157,175 | 3 | 4 | 5,554,440 |
| Money on short call in London .. | 225,720 | 0 | 0 | 1,083,456 |
| Bullion on hand and in transitu .. | 159,232 | 14 | 11 | 764,317 |
| Government securities .. .. | 316,777 | 5 | 0 | 1,520,531 |
| Bills receivable and securities in London | 2,042,229 | 17 | 7 | 9,802,703 |
| Bills discounted, and other debts due to the bank .. .. .. .. .. | 8,389,802 | 9 | 10 | 40,271,052 |
| Landed property, bank premises, &c. .. | 241,609 | 9 | 0 | 1,159,725 |
| | £12,532,546 | 19 | 8 | 60,156,224 |

### Profit and Loss Account.

| *Dr.* | £ | s. | d. | $ |
|---|---|---|---|---|
| To Dividend on 100,000 shares of £10 each, at rate of 10 per cent. per annum .. | 50,000 | 0 | 0 | 240,000 |
| Bonus at rate of 5s. per share, equal to 5 per cent. per annum .. .. .. | 25,000 | 0 | 0 | 120,000 |
| Balance carried to Profit and Loss New Account .. .. .. | 24,451 | 8 | 0 | 117,366 |
| | £99,451 | 8 | 0 | 477,366 |

| *Cr.* | £ | s. | d. | $ |
|---|---|---|---|---|
| By Balance from half-year ended 30th September, 1882 .. .. .. | 9,925 | 9 | 11 | 47,642 |
| Net profit for half-year ended 31st March, 1883 .. .. .. .. | 89,525 | 18 | 1 | 429,724 |
| | £99,451 | 8 | 0 | 477,366 |

### Reserve Fund.

| *Dr.* | £ | s. | d. | $ |
|---|---|---|---|---|
| To Balance .. .. .. .. | 600,000 | 0 | 0 | 2,880,000 |

| *Cr.* | £ | s. | d. | $ |
|---|---|---|---|---|
| By Balance from last statement .. .. | 600,000 | 0 | 0 | 2,880,000 |

This report shows the usual dividend of 15 per cent. has been paid, and the handsome sum of £24,451 8s., or $117,366, carried forward to the reserve fund, and that the net profit for the half-year ending the 31st March, 1883, was £89,525 18s. 1d., or $429,724. The Bank of New Zealand is rapidly and firmly extending its business. Its London offices are upon one of the finest sites in that city. It has also magnificent buildings in Sydney and Newcastle, New South Wales, and in Melbourne, Victoria, and has recently purchased a site for a splendid structure in Adelaide, South Australia. It has also established a branch office in Fiji, the youngest dependency of the British Empire, and corresponding agencies in Honolulu, the Hawaiian Islands, the United States, British North America, Mexico, Peru, Chili, Cape Colony, South Africa, the United Kingdom, Austria, France, Italy, Spain, Germany, Russia, and other countries.

## MAIL ROUTES TO AUSTRALASIA.

It has been well known for many years past throughout the Southern Hemisphere that the quickest and shortest mail route between the Australasian Colonies and England is by way of the Pacific Ocean to America, and from thence across the continent to London. On this account, the Governments of New South Wales and New Zealand did not hesitate to secure the transportation of their mails by subsidizing the vessels of the Pacific Mail Steamship Company at the rate of £72,500, or $362,500, per annum. The two Governments entered into a contract with the Pacific Mail Steamship Company on the 17th August, 1877. The contract insured speed at the rate of eleven knots per hour. The company's steamers have always made the trip within the contract time.

This route, notwithstanding the satisfactory manner in which the service has been performed, has proved an advantage only, as far as the quick delivery of the mails is concerned, to the Colony of New Zealand. The mails for Australia by the Orient and the Peninsular and Oriental lines are now closed in London twenty-four hours later than those by way of San Francisco. Besides, the latter is only a monthly service, while the steamers of the Orient and the Peninsular and Oriental lines each make fortnightly trips; thus insuring a weekly delivery of the mails.

The contract with the Pacific Mail Steamship Company has been renewed from November, 1882, and it has been agreed that the speed of the steamers shall be increased fully twenty-four hours. The Colonial Governments can withdraw from the contract after a period of twelve months, should the Government and people of the United States refuse to aid the company by subsidy or otherwise. The terms on which the contract was renewed are more favourable to the colonies than heretofore; the New South Wales Government being required to pay only £18,750, or $93,750, per annum, and the New Zealand Government £31,250, or $156,250. It has been further agreed that after the first year the route shall be shortened another twenty-four hours.

The failure of the United States Congress at the last session to aid the service has provoked no little criticism, inasmuch as the American Government derive very great advantages by means of the route. The trade between the latter country and Australasia would, in the event of the establishment of a faster and more frequent steam service, secure to the United States a large portion of the trade of the colonies which now goes to London.

During the year 1882 the exports of the Australasian Colonies reached the sum of £50,045,147, or $241,944,705. Of this trade the United States received less than £450,000, or $2,160,000. The imports to the colonies during the same year were £54,925,580, or $263,642,780. Of these imports the United States furnished only about £1,250,000, or $6,000,000. The heavy duties charged on Australasian wool in the United States, and the absence of frequent communication between the two countries by means of fast steamships and sailing-vessels, are the principal reasons for this vast disproportion in the trade.

The financial affairs of the various steamship lines trading with the colonies are in excellent condition. All are constructing new vessels, and the keen competition for freight is attracting the serious attention of shippers in London. The total amount of net tonnage cleared for the Australasian ports during the year 1881, excluding vessels for Indian ports taking cargo for transhipment at ports of call, according to a recent statement of Sir F. Dillon Bell, Agent-General of New Zealand in London, was over 696,000 tons, being by far the highest ever recorded, and showing an increase of 144,000 tons, or 25 per cent. over the preceding year, 1880. The proportion of steam to the aggregate tonnage is growing every day. There are now twenty-eight steamers, having a tonnage close on 99,000 tons, with 70,000-horse-power, on the berth to clear for the Australian ports. The Peninsular and Oriental ships are now carrying at the rate of 50,000 tons of cargo per annum from London to Australia. The Orient line carries 2,000 tons in each steamer. Their rates outward have ranged for ton measurement from £1 11s. 3d., or $7 50c., up to £2 12s. 1d., or $12 50c., and for express cargo from £2 12s. 1d., or $12 50c., to £5 4s. 2d., or $25.

The average increase of goods shipped by steam to the colonies is far greater than the average increase of goods shipped by sailing vessels. The New Zealand importer of American goods, in order to secure a prompt delivery of them, is obliged to have them shipped by way of London, Sydney, and Melbourne, which so enhances their cost as to seriously interfere with his profit. The cost of freights, however, will be materially diminished upon the establishment of several American steamship lines between San Francisco and the colonies, so as to secure something like a free and fair competition for freight.

The French Government has had its attention recently directed to the magnitude of the Australasian trade, and has been very energetic in perfecting arrangements with the Messageries Maritimes Company for a fast mail service to Australasia, by way of New Caledonia. The first ship, the "Natal," of the new French line, which left Marseilles on the 23rd December, 1881, arrived in Australia in January. All the steamers of this line have been built especially for the Australasian trade. They are of 4,000 tons burden, with 2,400-horse-power, and carry 670 tons of coal for ordinary service, and, when needful, can take 500 tons more. They have space for goods of 3,500 cubic metres, and can accommodate 75 first-class passengers, 76 second-class, 60 third-class, and 350 fourth-class. The French Government, in order to make the service permanent, has subsidized it for a period of fifteen years, at the rate of £138,541, or $665,000, per annum, to carry the mails to New Caledonia. The route chosen is by way of the Suez Canal, taking Marseilles as the starting-point, and from thence to Port Saïd, Suez, Aden, Mahé (Seychelles) Islands, Réunion, Mauritius, Adelaide, Melbourne, Sydney, and Noumea.

Since my return from America I have had an opportunity of examining the reports of the different Postmasters-General of the Australasian Colonies for the year 1882. Each report shows a large increase over the previous year, which in itself furnishes strong evidence of commercial activity and expansion of trade. The increase for the year 1882 of the number of letters received and despatched in the Colony of New Zealand alone over that of the year 1881 was 4,967,648, or 19·44 per cent.

The following table shows the number of letters, postal cards, book-packets, and newspapers received in and despatched from the Colony of New Zealand for the year 1882:—

| | |
|---|---:|
| Letters—Delivered | 15,526,719 |
| " Posted | 14,998,860 |
| | 30,525,579 |
| Postal cards—Delivered | 418,477 |
| " Posted | 540,618 |
| | 959,095 |
| Book-packets and pattern-parcels—Delivered | 1,087,584 |
| " " Posted | 1,308,671 |
| | 2,396,255 |
| Newspapers—Delivered | 7,357,473 |
| " Posted | 5,955,626 |
| | 13,313,099 |

The letters show an increase of 4,967,648, postal cards 86,555, book-packets 534,073, and newspapers 1,065,056, over the previous year.

The unsubsidized sea-service cost £3,839, or $18,427, and the land-service £24,808, or $119,078. The total distance travelled by the inland service was 2,902,594 miles.

The annexed statement shows the average time occupied in transmission of New Zealand mails *viâ* San Francisco and *viâ* Suez Canal:—

| | San Francisco Service. | Brindisi Service. |
|---|---|---|
| London to Auckland ... | 38·69 days | 54·23 days. |
| „ Wellington ... | 41·08 „ | 50·08 „ |
| „ Dunedin ... | 42·31 „ | 47·42 „ |
| „ Sydney ... | 43·54 „ | 41·23 „ |
| „ Melbourne ... | 45·54 „ | 39·54 „ |
| Auckland to London ... | 38·05 „ | 53·67 „ |
| Wellington to London ... | 40·05 „ | 55·29 „ |
| Dunedin to London ... | 41·05 „ | 52·77 „ |
| Sydney to London ... | 43·05 „ | 44·04 „ |
| Melbourne to London ... | 45·05 „ | 41·62 „ |

The newspaper Press here and at Sydney mention the probability of the White Star line engaging in the trade between San Francisco and Australasia. The White Star line has already extended its business to the Pacific Ocean, having three of its steamers—the "Oceanic," the "Germanic," and another—engaged in the trade between San Francisco and China. Its boats are each about 4,000 tons, and are fine specimens of naval architecture. This line would be able to form close connections with its main line from New York to Liverpool, which has been so renowned for making fast passages between those cities.

The advantages afforded by the San Francisco route for a speedy delivery of the mails are very great. The average mail time between London and Melbourne *viâ* the Peninsular and Oriental Steamship Company is thirty-nine days and two hours outward and forty-one days and twelve hours inward. The average time between London and Auckland *viâ* Melbourne is forty-nine days outward and fifty-three days inward. The average time between London and Auckland under contract of the Pacific Mail Steamship Company, which is only an eleven-knot service, was forty days outward and forty days and eight hours inward. The quickest passage ever made was thirty-eight days outward and thirty-six days inward.

The completion of railway communication between New York and Mazatlan, on the Gulf of Mexico, would make the American route still shorter, as Mazatlan is at least four days' sail nearer Auckland than San Francisco. In the transit between New York and Mazatlan there would also be a saving of thirty hours, as compared with the distance between New York and San Francisco.

The railway communication between New York and Guaymas is gradually approaching completion. This would also be a very short route for the Australasian mails, as the latter is 800 miles nearer Auckland than San Francisco. Should Guaymas be adopted as the port of departure, the Pacific route would be reduced to thirty-six and a half days between Sydney and London, provided no greater speed was obtained than eleven nautical miles per hour. This would give New Zealand her London mails in thirty-two and a half days.

Supposing these routes not to be feasible, there is no good reason why the speed of the San Francisco route should not be accelerated, both on the Pacific Ocean and across the continent. Between New York and Omaha the mails are conveyed speedily enough, but between Omaha and San Francisco great improvement can and ought to be effected. Indeed, the trains during the greater part of the journey across the continent do not move faster than at the rate of twenty miles per hour. The increase in speed here, it is said, will soon be equal to at least two days, and the transit of the mails across the continent will only occupy four and a half instead of six and a half days. Allowing eight days for the Atlantic voyage, four and a half days for the railway transit between New York and San Francisco, and seventeen days for the Pacific transit, makes a total of twenty-nine and a half days from London to Auckland, and twenty-one and a half days between New York and Auckland. This would enable the Pacific route to deliver letters at Sydney from London in thirty-four days, and would prove by far the shortest route for all the Australasian Colonies. The passage of seventeen days between San Francisco and Auckland need not be regarded as an unusually fast one, especially when we consider that the waves of the Pacific Ocean offer much less resistance to the progress of a vessel than those of the Atlantic. The truth is, the average speed of the best steamship lines on the Atlantic should be made the minimum speed on the Pacific. A fast-going ocean steamer like the "Arizona" or "Servia" could easily make the trip between San Francisco and Auckland within fifteen days. The distance from Auckland to Sydney and Melbourne can also be shortened thirty-six hours by the construction of a canal through the narrow neck of land at the Whau, which separates the east and west harbours of Auckland. When this canal is finished, vessels touching at this port will not then be obliged to go round the North Cape in order to continue their voyage to Australia.

### The Union Steamship Company of New Zealand.

The recent tender of the Union Steamship Company to conduct a direct steam service between this colony and England, and the probability of its placing, at no distant day, a fortnightly line of fast steamers between Auckland and San Francisco, have led me to furnish the Department of State with the following information in regard to the most successful steamship organization in the Southern Hemisphere.

About six years ago the Union Steamship Company did not own more than three or four small boats, and these were principally employed in the coastal service. The company now own a fleet of twenty-eight fine steamers, of an aggregate tonnage of 26,055 gross register. The directors of the company have always had the greatest faith in the magnitude of the resources and capabilities of the colony, and they have not been slow in anticipating the requirements of a large and steadily-increasing commerce. Whenever an opportunity arises for extending their service, or for co-operating with other steamship lines, they are found prepared to take advantage of the opportunity. The head-quarters of the company are established at Dunedin, one of the wealthiest and most prosperous cities in the colony. This was done principally for the purpose of profiting by the trade in proximity to that city. This trade was at once absorbed by the company. It was found that no other line could at all compete with it. The company's steamers now make bi-weekly trips round the east and west coasts of the colony, weekly trips to Melbourne and Sydney by way of Auckland and the East Coast, and fortnightly *viâ* Wellington and Cook Strait, and fortnightly trips to the Fiji Islands. It also performs the coastal service for the San Francisco Pacific mail steamers, which only touch at Auckland. The subjoined table contains a list of the steamers of the Union Steamship Company, with the name of each vessel, dimensions, tonnage, horse-power, speed, passenger accommodation, &c.:—

| Name. | Lgth. | Tons. | Horse-power. | | Passengers. | | Spd. |
|---|---|---|---|---|---|---|---|
| | | | Nom. | Effec. | Saloon. | Strge. | |
| | Ft. | | | | | | Kts. |
| Manapouri ... | 275· | 2,000 | 300 | 2,000 | 150 | 100 | 14 |
| Wairarapa ... | 275· | 2,000 | 292 | 2,000 | 150 | 100 | 13 |
| Hauroto ... ... | 285· | 2,000 | 250 | 1,500 | 100 | 150 | 13 |
| Tarawera ... ... | 300· | 2,500 | 250 | 2,350 | 150 | 100 | 15 |
| Waihora ... ... | 300· | 2,500 | 250 | 2,350 | 150 | 100 | 15 |
| Wakatipu ... ... | 290·1 | 1,797 | 256 | 1,250 | 108 | 71 | 12 |
| Rotomahana ... | 285· | 1,727 | 400 | 2,000 | 141 | 72 | 15½ |
| Te Anau ... ... | 270· | 1,652 | 207 | 1,450 | 120 | 87 | 14 |
| Arawata ... ... | 245·4 | 1,098 | 300 | 1,250 | 132 | 106 | 12½ |
| Ringarooma ... | 245·1 | 1,096 | 300 | 1,250 | 132 | 106 | 12½ |
| Rotorua ... ... | 226· | 926 | 172 | 900 | 86 | 60 | 12 |
| Albion ... ... | 218·3 | 806 | 180 | 800 | 86 | 121 | 10 |
| Hawea ... ... | 215·7 | 721 | 160 | 850 | 96 | 72 | 12 |
| Penguin ... ... | 220·5 | 680 | 180 | 900 | 76 | 30 | 12 |
| Wanaka ... ... | 174·8 | 493 | 120 | 600 | 70 | 33 | 10 |
| Taiaroa ... ... | 189·3 | 438 | 110 | 500 | 40 | 32 | 10½ |
| Waitaki ... ... | 164·8 | 412 | 90 | 450 | 53 | 38 | 10 |
| Beautiful Star ... | 119·2 | 177 | 30 | 150 | 22 | 16 | 8 |
| Maori ... ... | 144· | 174 | 65 | 300 | 28 | 20 | 9 |
| Hero ... ... | 224·3 | 985 | 150 | 600 | 53 | 62 | 10 |
| Southern Cross ... | 135·2 | 263 | 50 | 250 | 30 | 10 | 9 |
| Mahinapua ... | 160· | 450 | 80 | 500 | 30 | 30 | 10 |
| Omapere ... ... | 180·3 | 600 | 80 | 500 | 25 | 30 | 10 |
| Takapuna ... ... | 240· | 1,000 | 300 | 2,000 | 100 | 40 | 15 |
| Suva ... ... | 249· | 400 | 55 | 250 | 20 | 20 | 10 |
| Waihi* ... ... | 79· | 100 | 20 | 100 | 20 | ... | 9 |
| Boojum* ... ... | 70· | 40 | 12 | ... | 20 | ... | 9 |
| Snark* ... ... | 60· | 20 | 10 | ... | 20 | ... | 9 |

The "Takapuna" is of very light draught, and one of the fastest steamers on the Pacific Ocean. She is elegantly fitted up, and carries 100 saloon passengers. She is employed in carrying the mails between Auckland, Wellington, and Lyttelton, performing the journey by way of Manukau Harbour. The "Rotomahana" and "Te Anau" are great favourites with the public. The former is magnificently fitted up and steams easily from 15½ to 16½ knots per hour. Five of the steamers, the "Manapouri," "Wairarapa," "Hauroto," "Waihora," and "Tarawera," were intended to be of the same size and fitted up as nearly alike as possible. The length of the "Manapouri" between perpendiculars is 283 feet; extreme breadth, 36 feet; moulded depth, 25 feet; the height from the top of the main-deck beams to the spar-deck beams being 8 feet. She carries six teak-built boats, each of which is fitted with patent disengaging apparatus. She was launched on the 20th December, 1881, from the Leven Shipbuilding Yards, Dumbarton. She is constructed of steel, in accordance with Lloyd's rules for the 100-A three-decked class, and has a full poop, hurricane house, and topgallant forecastle. She has straight stem and an elliptic stern, the bottom of the vessel being constructed on the cellular and bracket-floor principle, continuous from peak to bulkhead, except in the boiler-room, through which space ordinary plate-floors are fitted. To add to her strength and security in case of collision there are seven bulkheads, five of which are watertight and extended as high as the main deck. The deck, spars, poop, hurricane, and forecastle, are of kauri, specially sent to Dumbarton from Auckland. She is schooner-rigged, the lower masts being of steel, fitted with sliding jack-stays. The engines are 350-horse-power nominal, indicating 1,200-horse-power, and they can propel the vessel through the water at a rate of 14 knots on a daily consumption of 35 tons. In the engine-room there is a Siemens's dynamo-electric machine and a Siemens's alternating current machine, driven by a Brotherhood engine at the rate of 750 revolutions a minute, also 170 electric lights, besides lights for discharging cargo. These lights, which are known as Swan's incandescents, are distributed throughout the vessel, and can all be lighted or turned out in an instant, or a single light can be so treated at will. The saloon is amidships, forward of the engine, and occupies the whole width of the vessel, the sleeping berths branching off fore and aft. The roof is tastefully gilded and painted, and the framing of the saloon consists of hardwood panelling, maple on mahogany, with rosewood moulding, and half-circular fluted columns of the same material. The dining-tables are eight in number, while at each there are sofa-seats, upholstered with Utrecht pale-green velvet, and mahogany revolving chairs similarly covered. The walls are panelled in hard woods, principally maple; in the centre of each panel are tastefully-painted designs; the mouldings are of rosewood, finished with fluted columns of the same wood, richly gilded. These columns are surmounted by carved Corinthian capitals, while a massively-carved cornice completes the whole. The roof is finished in sunk panels of a very delicate cream-coloured tint, with gold enrichments. The floors of the saloon, ladies' cabin, and sleeping berths are handsomely carpeted. The light colour of the decorations gives the interior a very airy appearance. Entrance is gained to the saloon by means of large doors, glazed in ground glass, artistically decorated. The doors of a handsome sideboard at the entrance to the saloon are decorated with hand-painted panels, burnt in. These were executed by Miss Denny, daughter of the builder. This saloon will seat 110 passengers, the total number that can be berthed in this part of the vessel being 125. The ladies' cabin is handsomely finished in polished hardwood panels, carved trusses, and cornice. The state-rooms number forty, and each berth is supported on mahogany turned pillars and fitted with spring bottom. The social hall, 26 feet long by 15 feet wide, is above the saloon proper, the inside being finished in polished woods of various kinds. The floor is laid in parquet work, while the sides are formed of polished woods. The inlaid work is exceedingly handsome, representing birds and fish, executed in pale green, on a maple groundwork. Sofa seats are placed all round the room, which is supplied with tables, a mirror, and a clock, together with a piano. Between this and the saloon stairway is the ladies' deck cabin, a very pretty and elegant apartment; while the smoking-room, under the forecastle deck, is lined inside with polished oak, neatly panelled. The "Wairarapa," a sister ship of the "Manapouri," has made the fastest time of any of the vessels belonging to the Union Steamship Company. The "Rotomahana," however, made the fastest time out from England, and, although only built for 15½ knots, she has proved her capacity of steaming in ordinary weather 17 knots per hour; but it is claimed that the steaming powers of the "Wairarapa" have not yet been fairly tested. The "Wairarapa" was built on the same lines as the "Manapouri," and is precisely like her in every way, in size, fittings, and decorations, with the one exception, that on the fore part of the dining saloon, where the "Manapouri" has a sideboard, this vessel has a recess or an alcove beautifully upholstered. She has a straight stem, and her engines, which are by the builders of the ship, are on the compound principle with all the latest improvements, and the cylinders are 70 inches and 40 inches, and are of 2,000 indicated horse-power. The boilers are of steel and are kept going by twelve furnaces. The passenger accommodation, including dining saloon, social hall, and sleeping berths, is of the very best description. The saloon occupies the full width of the ship, and is forward of the engines; the ceiling is of white enamel, and the sides and bulkheads are of sycamore and American walnut, while the panelling is relieved by figurative lacquered ware. The social hall is similarly decorated. The smoking-room is fitted with white-marble panelling, thereby avoiding the disagreeable smell of smoke which clings to upholstery and woodwork.

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* Steam-launches.

The company has also several large steamers building for the purpose of extending their service to China and Japan during the tea season. The importation of tea to this colony has become a very important trade. During the year 1882 there were imported to this colony 4,350,611 lb. of tea, of the value of £278,994 or $1,339,171, against 4,493,924 lb. of tea, of the value of £255,396 or $1,225,900, for the year 1881. The truth is, the Colony of New Zealand has made such rapid progress within the last few years that it has become absolutely necessary to increase its steam service.

The New Zealand Shipping Company (another colonial company) have put on a line of steamers to run between this colony and

England. The directors of this company, in a report to their shareholders on the 14th August, 1883, state,—

"*Direct Steam.*—Following the policy indicated at the last general meeting of shareholders, your directors have entered into a contract with the celebrated firm of Messrs. John Elder and Co., of Glasgow, to build three steamers, each of 4,000 tons gross register, with a sea-going speed of 12 knots. The steamers are being built of steel, are of the highest class, and will be in every way a credit to the company. All the vessels are now far advanced: the first will be launched during the present month, and is appointed to leave England for the colony in October next. Pending the completion of the company's vessels your directors in January last established a monthly direct line of steamers, comprising the White Star liners 'Ionic' and 'Doric,' the Cunard liner 'Catalonia,' and the British Shipowners' Company's 'British King' and 'British Queen,' all of which are new vessels, built within the last two years, and the most suitable the company could charter. These steamers have all made successful passages, especially the 'Ionic,' which vessel accomplished the voyage from Plymouth to Wellington in 43 days 22 hours; and, considering the short time the service has been established, your directors are well pleased with the support they have received from passengers and shippers, and with the results and future prospects of the company.

"*Refrigeration.*—The carriage of frozen meat, your directors believe, will form a most important element in the future trade of the colony, and space has been reserved for large shipments in the steamers now under charter to the company and also in those in course of construction."

This has been brought about without the aid of any subsidy, and is due solely to New Zealand enterprise. The first steamer, the "British King," left London for Wellington and Lyttelton on the 26th January, 1883, and was followed by the "British Queen," for Lyttelton. The "British King" is a steamer of 3,558 tons, or slightly larger than the vessels now employed upon the San Francisco mail service. In all, during the year 1883 this company despatched thirteen steamers from London for New Zealand direct, and as fast as they arrived in the colony they were despatched on their return voyage fully laden with New Zealand produce. The homeward route chosen is *viâ* the Straits of Magellan, longer in mileage than *viâ* the Cape of Good Hope, but possessing the advantage of steady favourable winds. The voyage occupies about 42–46 days, being shorter than the journey westward, with the delays of transhipping at Sydney. By means of this line the New Zealander, travelling to London, will obtain the advantages of a maximum of speed with lowness and certainty of cost. The direct service, however, will not be able to make anything like as quick time to London as the voyage by the Pacific mail steamers to San Francisco, and from thence across the continent. This route will always be preferred for rapid transit, even at the present low rate of speed across the Pacific.

## HARBOUR ACCOMMODATION.

Very few persons, save those versed in the Sailing Directions for the South Pacific Ocean, are aware of the fact that New Zealand possesses some of the largest and safest harbours in the world. The rapid growth of the colony, and the vast increase of its shipping interests within the last few years, more especially at the port of Auckland, have brought about improvements in the harbour accommodations of New Zealand that were not even thought of a few years ago. Then at Dunedin over £312,500 or $1,500,000 have been expended in the construction of the pier, patent slip, floating dock, and graving dock, and it is estimated that more than double that amount will have to be expended before the works now in progress there are completed.

Some idea of the extent of the shipping interests of the colony can be formed from the statement that the number of vessels, including their repeated voyages, that entered and cleared coastwise at the various ports of New Zealand during the year 1882 was 15,947, with an aggregate tonnage of 2,210,137. Of these vessels, Auckland cleared 4,041, with a tonnage of 340,614; Wellington, 1,477, with a tonnage of 308,306; Lyttelton, 1,615, with a tonnage of 280,028; Dunedin, 884, with a tonnage of 225,814.

It will be seen from the above figures that Auckland is in advance of all the other ports of the colony. It is only reasonable to expect that all this shipping would require extensive harbour accommodation.

Port Chalmers, the port of Dunedin, is what is called a bar harbour. The bar has a depth of 16½ feet on it at low-water, and the harbour extends within the entrance to the southward for about eleven miles. The Town of Port Chalmers is at the head of Koputai Bay, about seven miles within the heads, and is connected with the City of Dunedin by rail. At Port Chalmers, according to the "New Zealand Pilot," is anchorage for large vessels, their cargoes being conveyed to Dunedin by rail or lighter. A channel has lately been cut so as to enable the larger vessels to reach the Dunedin wharves, for whose aid there are steam-tugs. The Railway Wharf is 1,000 feet long. The graving dock at Port Chalmers is 328 feet in length, 50 feet wide at the gates, with a depth of 19 feet of water on the sill at high-water spring-tides. In connection with this dock is a workshop, fitted for repairing the machinery and boilers of large ocean-going steamers, and a steam hammer wielding a 15-inch shaft. Dunedin is connected by railway with Christchurch on the north, with the Bluff, Invercargill, and Riverton on the south, all of which are places of importance.

The Port of Christchurch, at Lyttelton, is exposed to the east winds, and vast sums of money and great engineering skill were required to put it in order. A secure inner harbour has been formed by the construction of two breakwaters, with an entrance between them, formed of rubble, faced seaward with huge blocks of stone. The eastern, or Officers' Point, breakwater is 2,010 feet in length, 40 feet wide, and 6 feet above high-water mark. A timber breastwork is built nearly its entire length on the inner side, called Gladstone Pier. The western, or Naval Point, breakwater is 1,400 feet in length. The area of water thus enclosed is 110 acres. The depth of water inside the breakwater and at the wharves varies from 23 to 16 feet at low-tide. The rise is 7 feet, and vessels of the largest size can be safely berthed at the wharves. The following is the berthage space: Gladstone Pier, 1,740 feet; timber breastwork, from Gladstone Pier westward to Naval Point, 3,850 feet; Screw-Pile Jetty, 1,030 feet; No. 1 Intermediate ditto, 800 feet; No. 2 ditto ditto, 800 feet; No. 3 ditto ditto, 800 feet; Tunnel-Mouth Jetty, 440 feet; Peacock Jetty, 800 feet: making a total of 10,260 feet, capable of berthing 20 ocean ships or steamers, 20 barques and brigs, 6 intercolonial steamers, and 20 coasters. This berthage can be readily increased by building additional jetties. Other improvements are under way. There is a graving dock of sufficient size to receive first-class ironclads. Its exact dimensions are as follow: Length on floor, 450 feet; width on floor, 46 feet; width on top at entrance, 62 feet; depth on sill at high-water, 23 feet.

The improvements now in the course of construction at Auckland will afford harbour accommodation far superior to any possessed by other ports in the Australasian Colonies. Auckland Harbour has long been regarded by masters of vessels as one of the largest and safest in this hemisphere. Vessels of the largest size can enter it at any state of the tide. The entrance between the North Head and the Island of Rangitoto is fully two miles wide, but the visitor is not aware of the dimensions of the harbour until he is abreast of the North Head. In 1852 the Government of Great Britain expressed a desire to make provision for an Admiralty station for her fleet in Australasia. The people of Sydney, New South Wales, at once petitioned Her Majesty's Government to select that port for the station. It was set forth in the petition that the harbour was a large and safe one, but conceded that ships of the line could not be admitted at all states of the tide on account of a bar at the entrance. This petition awakened some opposition on the part of the citizens of Auckland, who contended that the Auckland Harbour had no such obstacle. A memorial was therefore forwarded from Auckland to the effect that all war-vessels that attempted to enter the Sydney Harbour touched on the bar, and that, moreover, the tides at that port did not rise and fall more than four feet. Various naval authorities were cited in support of the claims of Auckland, including the opinion of Admiral Berand, of the French Navy, who said that, in point of position, facility of entrance and departure for ships of any burden, and at any time of tides, security of anchorage, sufficient rise of the tide (from 10 to 16 feet), and other natural advantages, Auckland as a head-quarters naval station would be infinitely superior to any other port of Australasia. Nothing was done at that time to bring about the desired result further than to direct attention to the matter. With respect to position, Auckland is nearer than Sydney to the French settlements of Tahiti and New Caledonia, also to South America, and it is the first Australasian port from Great Britain by the American mail steamers. Besides, the port is situated in the very centre of a rich and productive country, abounding with kauri forests, yielding the finest spars in the world, and timber trees for building and repairing ships of any size. It commands the East Coast by its own intermediate ports, and the West Coast by the accessory port of Manukau (or Onehunga). In approaching the port of Auckland, off the Tiritiri Lighthouse, an anchorage is afforded from 12 to 16 fathoms, and thence to Rangitoto the depth is from 8 to 9 fathoms. In the passage between the island and North Head the depth is from 8 to 10 fathoms, with safe anchorage in 6 to 7 fathoms, in any kind of weather. Opposite to the city the anchorage is from 7 to 9 fathoms for a breadth of one mile and a half, and six miles farther up a depth of 4 fathoms. Auckland is well supplied with wharves; the two principal ones are the Queen Street Wharf and the Railway Wharf. The former projects 1,680 feet from Customhouse Street into the harbour. It has a depth of from 18 to 20 feet of water at lowest spring-tides, and is capable of berthing vessels from 100 to 3,000 tons burden. The Railway Wharf is for a considerable distance an extension of solid breakwater. It is 1,050 feet long, with from 12 to 15 feet of water at lowest spring-tides, and can berth about fifteen vessels of suitable draught. Among the improvements in the Auckland Harbour now being rapidly pushed forward is a splendid graving dock at the North Shore. When completed it will have a length of 500 feet on the floor-line. It will also have a temporary head, so that in a few years, if it should be found necessary to lengthen the dock, it can easily be done by removing the temporary head, and excavating the earth and clay. The width of the dock is 80 feet. It will be able to take in with ease the largest ironclads in the British Navy.. The "Italia" and the "Lepanto" are, I believe, the largest war-ships in the world. They have a length of 400 feet 6 inches each (100 feet less than the length of the Auckland Dock), beam 72 feet 9 inches. Applying the same test to the great ocean merchant steamers, the new dock could take in any merchant steamer afloat, save the "City of Rome" and the "Great Eastern." It could take in the "Servia" (530 feet), and the "Alaska" (540 feet), but not the "City of Rome," as she is 610 feet in length. The average draught of these great ocean steamships is from 26 to 28 feet. There is no doubt that the Auckland Harbour has a greater depth of water than any other in the Australasian Colonies. The soundings recently made, and now marked on the new map issued by the Harbour Board, prove that the least depth is 36 feet at dead low-water springs, to which may fairly be added 10 to 16 feet for rise and fall. I learn from this map that the working ship channel, with an average depth of 36 feet, ranges from a maximum in parts of two miles, to a minimum of not less than a mile in width, in the section of the harbour comprised between the North Head and Kauri Point. It is said, however, that the merchant steam-vessels of the future will be shorter, broader, and of greater draught than some of the great ocean steamers at present running. Indeed, Mr. William Denny, the famous Clyde shipbuilder, has expressed the opinion that the Clyde trustees will shortly be compelled to provide a fitting highway for the heavier class of vessels. He pointed out that the steamers of the future would be very much broader than those now in use, and also much deeper, and would, of course, require a greater draught of water. He thought that the light draught of the steamer of the future would probably be not very much less than her load draught, and might be as deep if not deeper than the greatest load draughts at present.

The following are the dimensions of the principal docks in the Australasian Colonies: Mort's Dock, Sydney, New South Wales, 409 feet long, 68 feet wide at entrance, 19 feet 6 inches of water on sill at high-water; Fitzroy Dock, Sydney, New South Wales, 450 feet long, 58 feet wide at entrance, 20 feet 6 inches of water on sill at high-tide; Alfred Dock, Melbourne, Victoria, 450 feet long, 80 feet wide at entrance, 27 feet of water on sill at high-water; Government Dock, Brisbane, Queensland, 320 feet long, 60 feet wide at entrance, 20 feet of water on sill at high-water; Port Chalmers Dock, Dunedin, New Zealand, 328 feet long, 50 feet wide at entrance, 19 feet of water on sill at high-water; Lyttelton Dock, Lyttelton, New Zealand, 450 feet long, 62 feet wide at entrance, 23 feet of water on sill at high-water; Auckland Dock, Auckland, New Zealand, 300 feet long, 46 feet wide at entrance, 15 feet of water on sill at high-water; the North Shore Dock, Auckland, New Zealand, 500 feet long, 80 feet wide at entrance, 33 feet of water on sill at high water.

The central and commanding position of Auckland can easily be determined by examining the various routes which connect the ports of Europe and America with the South Pacific Ocean. By referring to the map it will be seen that the distance from Liverpool to Auckland by the Suez Canal is 12,706 miles; by the Cape of Good Hope, 14,073 miles; and by Cape Horn, 12,057 miles. It will also be seen that the distance of Auckland from New York by the Suez Canal is 14,637 miles; by the Cape of Good Hope, 14,505 miles; by Cape Horn, 11,860 miles; and by the Panama Canal it will be only 8,940 miles. But, even supposing that the Panama Canal should not be constructed, the proximity of Auckland to the American ports gives it advantages over any other city in the colonies. Before taking leave of the subject of the Auckland Harbour, I may mention that when Captain Cook first visited these islands he touched at what is now known as the Thames, and, on sailing in the direction where Auckland now is, he sighted the surrounding hills and islands in the Hauraki Gulf, and expressed the opinion that their position indicated the presence of some large and safe harbour. This fact is especially interesting, as it not only illustrates the maritime knowledge of the great navigator, but shows how near he came to having the honour of being the discoverer of Auckland Harbour.

## COAL FIELDS.

The constantly-increasing demand for coal in California, and the existence of a coal famine in Victoria and South Australia, have directed attention to the condition of the coal fields of this colony. The New Zealand settler has little or no idea of the vast stores of wealth that are bound up in his island home, A few years ago there was but one point in the whole of the vast territory of the South Pacific which competed with the American and English coal trade. I refer to Newcastle, in the Colony of New South Wales. The people of Australasia may well be proud of this interesting mining dépôt, situated at the mouth of the Hunter River. Vessels of the largest size can ride safely in the harbour and load immediately at the mines. The coal fields there are of no mean proportion. They extend fully 700 miles north of Newcastle. The average annual output of the mines is about 1,550,000 tons. The seams vary from 3 to 30 feet in thickness, and there is no question as to the quality of the coal. Fully one-fourth of the product of the mines is consumed in the Colony of Victoria, but the people of that colony anticipate a strong competition from New Zealand for the export coal trade.

Some of the specimens of New Zealand coal exhibited at the International Exhibition at Sydney, with coke made from the same, were pronounced to be of very superior quality. This was especially the case with the Brunner coal from Greymouth, and that from the Bay of Islands. The coal from the latter place is now very generally admitted to be quite equal to the best coal from New South Wales, and, moreover, it is said to burn with much less ash. Indeed, it is the opinion that the markets which that colony had hitherto monopolized must, in the near future, be shared with New Zealand. After mentioning the fact that the Bay of Islands coal can be purchased for the Australian ports from 12s. to 12s. 6d., or $2 88c. to $3 per ton, the Secretary of Mines of New South Wales says, "The New Zealand coals are of such quality as to render it possible that they may enter into competition with ours in markets outside of that colony."

In studying the history of the mines of this colony I regret not to be able to give the name of the person who first discovered coal in New Zealand. It is probably unknown. I learn, however, that the first reference to the existence of coal in this colony is in a work by Dr. R. G. Jameson, entitled, "New Zealand, South Australia, and New South Wales: a Record of Recent Travels in these Colonies." Dr. Jameson was the surgeon of an emigrant vessel that sailed from Liverpool for Adelaide in 1838. After his arrival at Adelaide he made a tour through the Colonies of Australia. In 1839 he visited New Zealand, not then under the protection of the British flag. In this volume, while describing a visit to Tauranga in 1839, he says: "Here, according to Mr. Bidwell, is to be witnessed the actual formation of coal. It is in some places a foot in thickness, and quite recent, consisting of nothing but leaves, &c., of the living plants of the country. It is regularly separated by layers of soft earth, of just the colour and appearance which the clayless strata under the coal-measures present, although entirely formed of partially-decomposed pumice."

The coal reported to have been seen at Tauranga has never been worked. Dr. Dieffenbach, who travelled extensively through New Zealand in 1840 and 1841, was able to show that coal was widely distributed throughout both the North and South Islands.

In 1849 coal was known to exist on the banks of the Tangarakau, a tributary of the Wanganui River, District of Wellington, but nothing has as yet been done to work the deposit. Coal was also discovered at Motupipi in 1840, shortly after the establishment of British authority in New Zealand. In 1845 an unsuccessful attempt was made by the settlers at Wellington to obtain a supply of fuel from this coal seam, and a sample ton of it was tried on board Her Britannic Majesty's sloop-of-war "Inflexible" in 1849. Mr. Tucker, the chief engineer of that vessel, made a favourable report of this coal. His report is dated the 29th March, 1849, and is, I think, the first official report ever made of a trial of New Zealand coal.

It was not, however, until 1858, when coal was discovered near Drury, twenty-four miles from Auckland, that a systematic effort was made to develop the coal mines of the colony. The coal seam near Drury was discovered by the Rev. Dr. Purchas, of Auckland, and, as it proved to be fully 6 feet in thickness, attracted no little attention throughout the colony. A company was at once formed for the purpose of working it. It was called the Waihoihoi Coal Company. It was soon found that the cost of carrying the product of the mine to Auckland would be very expensive—more expensive, at least, than the use of firewood, for timber was then abundant in the neighbourhood. A proposal was made to lay down a short tramway to the nearest navigable creek emptying into the Manukau Harbour; but this proposal was not acted upon, although every one admitted its practicability. It is probable, however, that there was not sufficient demand for coal to justify the necessary outlay. The population of the entire Colony of New Zealand was then not so large as that of Auckland at the present time. The time, however, was near at hand when the coal fields of the colony were to be developed in a manner not then thought of. The Maoris at that time were not only peaceably inclined, but were unusually friendly with the whites. In 1860 a dispute arose at Waitara, District of Taranaki, which culminated in a sanguinary conflict, and in a short time the war extended to the Waikato District. The whole of that vast fertile territory was at that period owned by the Maoris. No European was ever permitted to purchase a single acre of land in it. In 1863 the Colonial Government took measures to protect the European settlers in the neighbourhood of Auckland, and gradually pushed the war into the heart of the enemy's country. About this time a landslip disclosed the existence of coal at Kupakupa, on the banks of the Waikato River. Up to this time no European craft had ever been permitted to float upon this broad and beautiful river. But the accidental discovery of a thick coal seam on the banks of the river, between eighty and ninety miles from its mouth, was indeed a fortunate circumstance in the war with the Maoris. Steamers were placed on the Waikato to convey troops and supplies to the scene of action. The coal seam at Kupakupa was situated at an elevation which enabled the product of the mine to be shot directly into the bunkers of the steamers. The seam was opened up by the Government in order to provide fuel for the steamers; and this was the first seam of coal that was ever successfully and systematically worked in New Zealand. The Waikato District is now connected by rail with Auckland, and the coal seams there extend over a very large area. These mines have been opened up on a seam varying from 18 to 55 feet in thickness. Valuable bands of ironstone are also found in that district, which yield fully 40 per cent. of metallic iron.

The coal found in the basins of the Waikato and Mokau, and also on most of the tributaries of the Wanganui, is a species of brown coal belonging to a Tertiary age. The seams are covered with bituminous shales, sandstone, conglomerates, and solid quartzites, such as are often met with in the centre of Europe, especially within the range of the brown-coal deposits of Germany and Austria. The topmost layers generally consist of tabular limestones, often protruding at the top of cliffs. This geological fact will give the curious observer an ample opportunity to satisfy himself that the limestone formations in both the North and South Islands of New Zealand overlie beds of brown coal.

In the South Island of New Zealand deposits of brown coal are found near the Malvern Hills, thirty miles from Christchurch, and vast areas of the mineral extend and underlie the Tertiary rocks of the higher portions of the great Canterbury Plains. In Otago it extends to near the Molyneux River, over at least fifty square miles, forming hills from 500 to 1,000 feet in height. In this formation there are several seams of good coal, varying from 6 to 20 feet in thickness, and, in passing along the seashore, one section of this coal fully three miles in length and 56 feet thick is exposed to view. It is estimated that this district alone contains over 100,000,000 tons of accessible coal. Several mines have been opened out, and one in particular, the Clutha Mine, three miles from the river of that name, has been successfully worked. Within six miles of Dunedin is another important basin, called the Green Island and Saddle Hill. Two of the seams there, from 7 to 9 feet thick, have been opened, and are successfully worked. There is an area of ten square miles in the vicinity of Green Island containing a seam 18 feet thick. Owing to the soft nature of the roof and floor it has been the practice to work only 6 feet out of the centre of the seam, about two-thirds of the coal being left and wasted. This extravagant method is occasioned by the scarcity and high price in Otago of timber suitable for propping the mines.

There is still another great area of brown coal on the western seaboard of Otago, east of the Kakanui Mountains. At Kaitangata there is an important field of about forty square miles. The seams worked there are about 27 feet thick, and the product is very good, having a hard splintery fracture and laminated structure. A firedamp explosion occurred there in 1879, killing thirty miners. Indeed, in all the districts of New Zealand there are many large deposits of this coal which have not yet been worked, but which some day will prove of great value to the people.

The black coal fields of New Zealand are very extensive. They are found in both the North and South Islands. They occupy large areas in the Districts of Auckland, Nelson, Canterbury, and Otago. This coal belongs to a Secondary or Mesozoic age. A fine seam of it has been opened about seventy miles north of Auckland, in the vicinity of the Harbour of Whangarei, and another seam on the

Kawakawa River, which empties into the Bay of Islands. The use of the diamond-drill has demonstrated that several other fine seams exist besides those now being worked.

Attention was directed to the Kawakawa coal as early as 1860. Several unsuccessful efforts were made to develop the seams, and latterly the Bay of Islands Coal Company was formed. This company infused new life and vigour into the mines, and the result has been a very large annual output. The coal is hauled up by means of engine-power placed opposite the dip. The coal dips from north-east to south-west, the dip being about 1 in 4. The coal is carried by railway and barges to the loading grounds, where vessels of every size can receive their cargoes. The Union Steamship Company and the San Francisco mail boats are regularly supplied with this coal. It is of very superior quality, is hard, and burns freely. It has been found to contain 93·20 per cent. of combustible matter, the remainder being 4·60 per cent. of water and 2·20 per cent. of ash. Its theoretical evaporative power is 7·44 lb. Its specific gravity is about the same as that of Newcastle coal. The following is the exact chemical composition of the Bay of Islands coal in 100 parts:—

| | |
|---|---|
| Fixed carbon ... ... ... ... | 57·2 |
| Hydro-carbon ... ... ... | 36·0 |
| Moisture ... ... ... ... | 4·6 |
| Ash... ... ... ... .. | 2·2 |
| | 100·0 |

Specific gravity, from 1·287 to 1·301.

This coal has been highly commended in a report of Commodore Wiseman, of Her Majesty's ship "Curaçoa," and a series of experiments were made on board one of the Colonial Government steamers, when it was determined that it had an evaporating power, to the extent of 29·68 per cent., over the Australian coal.

Coal of fully as good quality as the Kawakawa is furnished at the Kamo Colliery, about twenty-five miles distant from Auckland. Indeed, many are of the opinion that the Kamo workings are only the southern outcrop of the seam at Kawakawa, and that other and still more valuable seams lie underneath. Whether this opinion will prove correct or not I am unable to say, but it must be confessed that the indications are very favourable to the conclusion that there is one vast coal bed from Kamo to Kawakawa. The New Zealand Government has constructed a railway from the Kamo mines to the river emptying into the Whangarei Harbour. This harbour is perfectly safe, and of sufficient depth of water for the largest-sized ocean steamers. The completion of the railway to the river has enabled the company to more than double the annual output of the mines. The seams worked at present are 11 feet in thickness, and extend over a vast area. This colliery just now is attracting more attention than any other in New Zealand.

I learn, from a recent report by Dr. Hector, the Colonial Geologist, that Mr. Laird, engineer of the steamer "Argyle," made a trial of a ton of this coal, and found that the vessel ran thirty-three and a quarter miles in four hours, and that the quantity of ashes was only

10 per cent. The average number of revolutions per minute was 132; pressure of steam, 70 lb.; vacuum, 23¼ inches. Kamo coal, when analysed, is found to consist of the following parts: Fixed carbon, 56; hydro-carbon, 39·75; ash, 0·61; sulphur, 1·20; water, 2·44. This coal is now very generally used for blacksmiths' purposes. A trial of it was made at the workshops of Messrs. Cousins and Atkins, of Auckland. The workmen at first had little confidence in it, and were unwilling to risk work of any importance to the chance heat; but, after experimenting, they found that the coal furnished heat equal to that which could be obtained from the best imported coal. The heating and welding of a valuable piece of carriage-work was found to be perfect; and what surprised those who were present, and who were skilled in such matters, was the small amount of scale which came off the heated iron. The colour of this coal is black; lustre, resinous; fracture and cleaverage are very irregular and granular; powder and streak, dark-brown and glistening.

The coal mines in the South Island outnumber those of the North Island, but many of the former are on a very small scale, being either open-work or prospecting mines: however, even the smallest of them are inspected by the Government. The most important of the South Island mines are on the Grey and Buller Rivers. The seams are very thick, and are capable of producing many millions of tons of the best workable coal. These mines are only in their infancy. The first shipload of Buller coal that reached Wellington was in 1877, but since the quality became known its tendency has been to check the imports of coal from Newcastle, New South Wales. The product of the Brunner mine in 1882 was about 44,000 tons. This mine was opened in 1873, and since that time it has produced over 250,000 tons.

The total product of all the coal mines in New Zealand for 1882 was 378,272 tons of coal, against 337,262 tons for the year previous. The yield in 1878 was only 162,218 tons, and during that year 172,254 tons were imported from Newcastle. In 1882 the imports of coal from Newcastle amounted to 126,258 tons.

The average annual export of coal from New South Wales to San Francisco is between 80,000 and 90,000 tons. The cargo of the "Crysomene," which sailed from Newcastle in January last, sold readily in San Francisco at £1 8s. 1½d., or $6 75c., per ton. The cost of Newcastle coal at the mine is about 10s., or $2 40c., per ton, and the freight to San Francisco is 13s., or $3 12c., per ton, which would furnish a small profit to the exporter, even after allowing a large margin for wharfage, duty, and other incidental expenses.

The people of California and other States on the Pacific slope complain very bitterly of the United States import duties on coal. Even slack coal is taxed at the rate of 30 cents per ton of 28 bushels, and the duty on bituminous and shale coal is 75 cents per ton. Congress refused to reduce the duty at the last session. A drawback, however, is allowed in the revision of the tariff approved the 3rd March, 1883, of 75 cents per ton on all bituminous coal imported into the United States to be used for fuel on board of vessels propelled by steam. It is also provided that the drawback shall be paid under such regulations as the Secretary of the United States Treasury shall prescribe.

### FACILITIES FOR PROCURING COAL, AND FOR REPAIRING VESSELS.

According to Dr. Hector there are two classes of coal in New Zealand: Class I., *hydrous*, containing an excess of combined water, lignite, brown coal, and pitch coal; Class II., *anhydrous*, containing very little combined water, glance-coal, semi-bituminous coal, and bituminous coal.

Class I. is found in both the North and South Islands. In the South Island it is principally on the eastern coast. In the North Island up to the present time it has been found in the basins of the Waikato and Mokau, and also in most of the tributaries of the Whanganui. Pitch coal is extensively worked in both islands. Brown coal is very abundant all through the Waikato District. The seams are covered with bituminous shales, sandstone conglomerates, and solid quartzites such as are met with in the centre of Europe, especially within the range of the brown-coal deposits of Germany and Austria. The topmost layers generally consist of tabular limestones, often protruding at the top of cliffs. Lignites occur in the interior of Otago and other places.

Class II., anhydrous coals, found in New Zealand, are amongst the best in the world. Bituminous coal is worked principally in the Nelson District. There is one seam 18 feet thick at the Brunner Mine, on Grey River. At Mount Rochfort or Buller Mines the seams vary from 10 to 40 feet in thickness. Dr. Hector states that accurate surveys of this coal field show that it contains 140,000,000 tons of bituminous coal easily accessible of the best quality.

The two principal mines in the North Island are the Kawakawa (Bay of Islands Coal Company) at Russell, and the Kamo Colliery at Whangarei. The Taupiri Mines are also extensively worked, and furnish excellent coal for steaming purposes, but it is not quite so good as the others. Coal in vast quantities, similar to that of the Waikato District, is found on the Bridgewater Estate, near Auckland. Besides the coal produced in New Zealand, considerable quantities are imported from Newcastle, New South Wales. The amount produced in the colony is nearly two-thirds greater than that imported. The amount raised in the colony during the year 1882 was 378,272 tons, whilst that imported was only 129,582 tons.

The Newcastle coal is quite equal to the best Welsh coal for steaming purposes, and superior to it for manufacturing gas. The coal-seams in New South Wales are practically inexhaustible. They extend from the 29th to the 36th parallel of south latitude, and penetrate for miles along the seaboard. The annual output is 1,350,000 tons, and it is estimated at this rate that the coal-seams there will last for over five hundred years. These seams give employment to 3,148 miners, and they are enabled to conduct their operations with comparative safety. It is said but one fatal accident has ever occurred at these mines from fire-damp explosions.

I have already referred to the fact that the Secretary of Mines of New South Wales has expressed the opinion that the foreign coal market hitherto monopolized by that colony must in the near future be shared with New Zealand. The truth is, the coal-seams of New Zealand are so vast that they extend over the greater part of the North and South Islands.

The amount of New Zealand coal on hand on the 1st November, 1883, at the various ports in the colony was 6,000 tons, and that of Newcastle 2,250, distributed as follows:—

| — | New Zealand Coal. | Newcastle Coal. |
|---|---|---|
| | Tons. | Tons. |
| Auckland ... ... ... ... | 1,000 | 500 |
| Russell, Bay of Islands ... ... | 500 | Nil |
| Whangarei ... ... ... | 500 | Nil |
| Wellington ... ... ... | 1,000 | 500 |
| Lyttelton (Christchurch) ... ... | 1,250 | 600 |
| Dunedin ... ... ... ... | 1,260 | 650 |
| Westport ... ... ... | 250 | Nil |
| Picton ... ... ... ... | 250 | Nil |

There is always a supply of coal at Westport and Picton, but it is accessible only to small boats. The ports at which large steamers can obtain coal are Auckland, Russell, Whangarei, Wellington, Lyttelton (Christchurch), and Dunedin. The average total amount of coal on hand is 7,750 tons. The following table shows the average quantity of each kind of coal at the principal ports of the colony:—

| — | New Zealand Coal. | Newcastle Coal. |
|---|---|---|
| | Tons. | Tons. |
| Auckland ... ... ... ... | 1,000 | 500 |
| Russell, Bay of Islands ... ... | 500 | Nil |
| Whangarei ... ... ... | 500 | Nil |
| Wellington ... ... ... | 1,000 | 550 |
| Lyttelton ... ... ... | 1,200 | 600 |
| Dunedin ... ... ... ... | 1,250 | 650 |

The above amounts are exclusive of the quantity held by the gas companies and by dealers for local consumption.

The cost of New Zealand coal at the mines is from 12s., or $2 88c., to 12s. 6d., or $3, per ton, but when delivered at Auckland it is 17s. 6d., or $4 20c., per ton. Newcastle coal at Auckland is from £1 10s., or $7 20c., to £1 13s., or $7 92c., per ton. The cost of delivering and stowing coal in the bunkers of ships is from 9d., or 18c., to 1s., or 24c., per ton, thus making the total cost of New Zealand coal aboard ship from 18s. 3d., or $4 38c., to 18s. 9d., or $4 50c., per ton. The cost will be materially reduced when the wharfage facilities are increased, and other improvements completed now in the course of progress at each of the ports in the colony.

The method of coaling ships at the New Zealand ports is very much slower than that practised in the United States. Coal elevators and other improvements used there for expediting this kind of work have not yet been introduced here. The facilities for coaling ships are said to be greater at Russell, Bay of Islands, than anywhere else in the colony. The Bay of Islands Coal Company claim to be able to coal at the rate of 100 tons per hour. The time employed at the other ports is very much slower than that. The method of coaling the Pacific mail steamers at Auckland is very far from being a rapid one. The quickest time in which any one of them was loaded occurred recently, when 400 tons were put aboard in twelve hours. The method usually pursued is to tow a coal-hulk or barge alongside of the vessel, and lift the coal into the ships in baskets, each containing about 150 lb., by means of a steam-winch. Vessels can be loaded at all the large ports in the colony throughout the year without any interruption by the elements. The Taupiri Coal Company frequently load vessels at the railway wharf in Auckland. The coal is brought direct from the mines, a distance of 65 miles, in railway wagons or trucks to the side of the ship, and put aboard by means of an iron shoot. There is, however, no way of elevating the coal, and it depends altogether on the draught of the vessel whether it can be loaded or not. A steamer of 2,000 or 3,000 tons can be loaded easily at the railway wharf if its draught brings it below the level of the wharf; otherwise it must receive its coal from barges or coal-hulks in the manner I have heretofore described.

There is no Government coaling-station belonging to any nation in the vicinity of New Zealand. The German war-vessels cruising in the South Seas have for many years made Auckland their headquarters for coaling and for repairs. French, Russian, and Italian war-ships also call here from time to time for the same purposes. A supply of coal from 3,000 to 3,500 tons is usually kept at Noumea, the principal town in the French colony and penal settlement of New Caledonia. This coal is obtained principally from Newcastle, New South Wales, although recently coal has been sent to Noumea from Greymouth and Westport, in the South Island of New Zealand. The steamers of the Messageries Maritimes Company touching at New Caledonia usually coal at Sydney and Newcastle. A small supply of coal is kept at Suva and Kandavu, Fiji Islands.

The United States, by the Treaty of Commerce and Friendship with the Government of Samoa in 1878, secured the right to establish a coaling-station at the spacious and beautiful harbour of Pagopago. The importance of this concession, which was secured during my residence as Consul at Samoa, is now greatly enhanced by the prospect of the early completion of the Panama Canal. The entrance to the harbour of Pagopago is fully a third of a mile wide, and is well marked by the Tower Rock and Devil's Point, and lies between two hills, that on the west conical and that on the east elliptical. The shore-reefs extend 100 to 200 yards from the beach, perpendicular or shelving on their outer edge and awash at low-water mark. The surf breaks over them at all times, distinctly marking their outline.

At Auckland, as I have said previously, steamers of suitable draught can receive coal direct from the trucks at the railway wharf. The New Zealand Government steamers "Stella" and "Hinemoa" load in this way. The usual method, however, of coaling steamers at all the principal ports in the colony is by means of coal-hulks or barges, which are loaded direct at the coal-yards, and brought alongside of the steamer. There is no other country in the world that offers at this time greater opportunities for the introduction of American machinery for coaling vessels than New Zealand.

There are ninety-one coal-mines in operation in the colony, the South Island having by far the greatest number; they are, however, with one or two exceptions, not so productive as those of the North Island, many of them being only surface-mines.

During the year 1882 the Kawakawa Mine produced 41,484 tons, Kamo 21,232, Taupiri 25,381—all in the North Island; Koranui (Westport) produced 48,384 tons, Pit Heath (Greymouth) 18,765, Golden Fleece (Reefton) 940. The yield of the Kawakawa Mine is not so large as that of the previous year, but the seams there are so extensive that with improved machinery there is no reason why they should not be worked successfully for centuries to come.

During the month of November last the discovery of a new seam 9 feet thick at the Kamo Colliery was announced. The company there has for some time been occupied in putting down a shaft where the seam was discovered: £50,000, or $240,000, was expended on this shaft and the pumping and winding gear connected with it. The shaft is about half a mile from the original workings on the mine, and three chains from the railway. The seam has been cut 220 feet below the surface, and samples taken from it are superior to the coal taken from the upper workings. Tests of four barrow-loads lasted five hours, whereas the same quantity from the upper workings only lasted three hours. The present output of this company ranges from 450 to 500 tons per week, but the new seam opened will, of course, increase largely the output. Very great results are also expected from the mines on the Bridgewater Estate. A company having been formed recently for working them, these mines, on account of their proximity to Auckland, facility of access, and great extent of coal, are likely to play a very important part in the coal-supply of the colony. The Miranda Coal Field, a portion of the Bridgewater Estate, is situated within ten miles of the well-sheltered Hauraki Gulf, a branch of which constitutes the Auckland Harbour, and, as a level country extends from the mines to the sea, there are great facilities for railway construction. On the other side of the field, bordering on a navigable river by which access for barges is obtained to one of the stations on the Auckland trunk railway, also about ten miles distant, ninety trial pits have been sunk and coal has been found over all the property, at a depth varying from 7 to 30 feet, and in a seam 54 feet thick. The coal is of good quality, having been tried by two local steam-companies and also by the locomotives on the Government railways, and found to be excellent for steam-producing purposes. The portion called the Miranda Coal Field, which is now being opened by the Miranda Coal and Iron Company for the mining of coal, will be utilized also for the production of iron, iron ore of a very pure character and in great quantity being also found; but outside of this and in several parts of the remainder of the Bridgewater Estate the coal-seams have been found to extend over many thousands of acres. From its neighbourhood to Auckland, forty miles distant, and its close proximity to the well-sheltered and deep waters of the harbour, with a railway from the mines to the shipping-place, coal can be delivered on ship-board at a cost to the company of about 4s., or 96c., per ton. The low price at which coal can then be obtained cannot fail to have a marked effect upon the prosperity of Auckland.

The owner of the Bridgewater Estate has the exclusive right to manufacture patent fuel in New Zealand similar to that so extensively used in France and Belgium. With this process he is enabled to work up all the small waste and dust coal and form it into *briquets*, varying from 2 lb. to 16 lb. weight each. A ton of these *briquets* will occupy much less space than the heavier material, and at the same time produce far greater heat. It has also the advantage of being nearly smokeless, clean to handle, and free from dust.

The greatest advantage, however, claimed for the manufacture of patent fuel here is the cheapness of the material, whereas at Havre it has to be imported from England. The cost of the manufacture of patent fuel per ton at Havre is as follows:—

| | s. | d. | | $ | c. | | s. | d. | | $ | c. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal ... ... ... | 4 | 0 | or | 0 | 96 | to | 5 | 0 | or | 1 | 20 |
| Freight ... ... | 6 | 0 | „ | 1 | 44 | „ | 6 | 5 | „ | 1 | 54 |
| Duty ... ... | 1 | 0 | „ | 0 | 24 | „ | 1 | 1 | „ | 0 | 26 |
| Handling and manufacturing ... ... | 2 | 3 | „ | 0 | 54 | „ | 2 | 3 | „ | 0 | 54 |
| Pitch ... ... | 4 | 0 | „ | 0 | 96 | „ | 4 | 0 | „ | 0 | 96 |
| | 17 | 3 | „ | 4 | 14 | „ | 18 | 9 | „ | 4 | 50 |

The following table shows in detail the cost per ton of the manufacture of patent fuel on the Bridgewater Estate, in the District of Auckland:—

| | s. | d. | | $ | c. |
|---|---|---|---|---|---|
| Coal ... ... ... ... | 2 | 0 | or | 0 | 48 |
| Freight ... ... ... ... | Nil | | | | |
| Duty ... ... ... ... | Nil | | | | |
| Handling and manufacturing ... | 2 | 5 | or | 0 | 58 |
| Pitch and other material ... ... | 4 | 5 | „ | 1 | 06 |
| | 8 | 10 | „ | 2 | 12 |

The nearest port outside of New Zealand at which coal can always be obtained is Sydney, New South Wales. Coal is also found in limited quantities in various parts of Queensland, but it must be borne in mind that New Zealand and New South Wales are the principal coal-producing countries in Australasia.

There are four dry docks in New Zealand—one at Dunedin, one at Lyttelton (the seaport town of Christchurch), and two at Auckland. One of the latter, the Calliope Dock, is not yet completed, but is being rapidly pushed forward. When finished it will be the most superb work of the kind in Australasia. It will be seen by my report on the harbour accommodations of New Zealand that this dock is 500 feet long and 80 feet wide, and that it has 33 feet of water on the sill at high water. It is 50 feet longer than either of the large docks at Sydney or Melbourne, and is so arranged that it can be made 150 feet longer when required, by removing the temporary head. This important work was begun in order to meet the demand for repairing large ocean-going steamers in these seas. The proximity of Auckland to the American ports, its central position, and its magnificent harbours, one on the east and the other on the west coast, give it advantages not enjoyed by any other Australasian city. A glance at the map will show that there is no other port in the colonies so equidistant on the different routes from England as Auckland. The distance from Liverpool to Auckland by the Suez Canal is 12,706 miles; by the Cape of Good Hope, 14,073 miles; by Cape Horn, 12,057 miles; and by the Panama Canal, 11,549 miles. Auckland is not only nearer to San Francisco but to New York than any other Australasian port. The distance from New York to Auckland by the Suez Canal is 14,637 miles; by the Cape of Good Hope, 14,505 miles; by Cape Horn, 11,860 miles; and by the Panama Canal, 8,940 miles.

The harbour of Auckland on the east coast is one of the largest and most beautiful in the world. The entrance to the port between North Head and Rangitoto is two miles in width. In fact the harbour takes in a large portion of the Hauraki Gulf, and is large enough to float the navies of every nation on the globe. Its depth is 36 feet at dead low-water spring-tides, to which may be added 10 feet for rise and fall.

Auckland has more than doubled its population within the last few years. When the canal across the Isthmus of Panama is completed, Auckland will come in contact with the direct trade between the old and the new world. It will probably be the first port of call and the last of departure for all vessels trading between Australia, Europe, and America. The projected canal across the narrow neck of land at the Whau when finished will enable vessels coming from Europe and America to continue their voyage to Australia by way of the Manukau Harbour without going around the North Cape. It will be well enough to mention amongst the proposed improvements in the Auckland Harbour the dredging of the intervening space between the two wharves, so as to gain a depth of 24 feet at low spring-tides, thus providing an inner harbour or tidal basin fifty-three acres in extent. It is also proposed to illuminate this basin with Edison's electric light. Indeed, when I think of the commanding and central position of Auckland, together with the vast resources of the surrounding country, I stand amazed at the promise of her future greatness. She will soon be placed in communication by railway with Wellington, the capital of the colony, and with other important towns of the North Island. If a more general knowledge prevailed abroad in regard to the genial climate of Auckland, I am sure that a large migration hitherward would be the result, and I have not the slightest hesitation in saying that as a site for extensive commerce she stands the peerless queen of the Pacific. The scenery by which she is surrounded is not surpassed anywhere on earth in beauty and magnificence.

There is but one Corinth north of the Equator and but one south of it, but Nature has been far more prodigal to the southern Corinth than to the northern one. The Corinth of the North became one of the most important cities in the Old World. She, like her southern sister, commanded a vast trade on the east and on the west. The northern Corinth was surrounded by old and populous States, from which she drew her trade and wealth. The southern Corinth has already entered upon a brilliant career without these advantages, for the vast territories by which she is surrounded are as yet but thinly inhabited. She has, however, begun a course of absorption which must increase from year to year. Ponsonby is already in the city limits. The other suburbs, Newton, Parnell, Kyber Pass, Remuera, and Newmarket, will soon follow, and this process of aggregation around a great centre will, I believe, go on year by year until the neck of land between the two harbours will become one vast, magnificent, compact, and homogeneous city.

The next largest graving dock in New Zealand is at Lyttelton. It was opened on the 3rd of January, 1883. It is situated west of Naval Point. Its length is 450 feet, and its width at the entrance between the copings is 92 feet. The depth of water on the sill is 23 feet at high water. The width on the floor is 46 feet. The floor consists of 2 feet of masonry on 2 feet 2 inches of concrete. The excavations and masonry cost £91,336, or $438,413. The entrance is closed by an iron caisson, 62 feet long, 19 feet beam, and 28 feet deep. The dock is emptied by two centrifugal pumps, worked by a pair of fifteen-horse-power nominal engines. These will empty it in five hours. The dock was commenced in October, 1879, and the last stone was laid in February, 1882.

There are several large machine-shops and foundries at each of the principal ports in New Zealand, at which the steamships regularly making trips here can be refitted and repaired. Heavy forging, however, such as a crank-shaft or propeller, is not done here. The largest forging machine in New Zealand is at Port Chalmers, where they have a steam hammer weighing two tons. The Phœnix Foundry, at Auckland, is one of the most complete establishments of the kind in the colonies; it can work a forging of two tons, and has made a piston, weighing over three tons and a half, for an 84-inch cylinder. A. G. Price and Co., an American firm at the Thames, thirty-eight miles from Auckland, have built a number of fleet steamers of small tonnage. Duffie and Co., of Auckland, built the "Golden Crown," 320 tons, now employed in the coastal trade at Melbourne, and one of the fastest steamers in these waters, her average speed being fourteen knots per hour.

Until the new Auckland dry dock is finished ships of the size of the "Austral," 5,250 tons, which was recently sunk in the channel at Sydney and afterwards raised, will have to go elsewhere for repairs. The Fitzroy Dock is large enough to admit the "Austral," but the depth of water, 20 feet on the sill, is insufficient to float in the steamer even at high tide. The dock at Melbourne has depth enough to admit her, but the defect there is that the dock is too short, so that this splendid steamer after she was successfully raised had to go to England for a thorough overhauling. Several of the foundries however in Auckland are making preparations for enlarging their works in view of the early completion of the Calliope Graving Dock.

## THE GOLD FIELDS OF NEW ZEALAND.

The prospects of the gold fields of New Zealand are brighter than they have been for many years. New discoveries are reported. The average yield of the mines for several years past has been £1,000,000 or $4,800,000. The total value of the exports of gold from the colony since the year 1857 has been £39,250,219, or $188,401,051. The largest export occurred in 1866, when the amount was £2,844,517, or $13,653,681. The next largest was in 1871, when it reached the sum of £2,787,520, or $13,380,096.

No one, as yet, has published a systematic history of the discovery of gold in New Zealand, but the first discovery was probably made in the District of Auckland. Who was the discoverer, or in what quantities gold was found in the years preceding the occupation of the Islands as a British colony, it is impossible to state.

For many years after the occupation of Australia by Great Britain, New Zealand was visited by sailing-vessels. Whaling vessels frequented these shores between 1770 and 1840, and helped to direct attention to the fibre known as New Zealand flax (*Phormium tenax*), and the valuable timber which the forests of the colony contained.

When regular settlement was begun in Australia in 1778 the intercourse with New Zealand began to increase, and in time the merchants at Sydney, then called Botany Bay, sent down agents for the purpose of residing on the Islands, to gather produce from the Maoris, and to extend trade. Many of these agents were shrewd but unscrupulous men, and no doubt in their travels from one Native settlement to another made discoveries with which they never acquainted the Maoris. It is certain that the Maoris had no knowledge of the use of gold or any other metal. The trade conducted between them and the whites was profitable and rapidly extended. Not a few of the agents were deserters from whale-ships that visited the Islands. These men lived with the Maoris, married Maori women, and thus became advisers of the Maoris with whom they traded. At what time the discovery of gold was made is not known, but Graffe, the traveller, who visited the Bay of Islands in 1830, reported the existence of gold in the Thames River. It is possible, however, that between 1830 and 1840 gold was washed out of the beds of small streams, and taken to Sydney.

In 1852 gold was found by S. M. F. King in Driving Creek, Coromandel, although it was not until 1857 that the precious metal was included in the list of colonial exports. The rich gold discoveries made in Victoria in 1853 withdrew the attention of the public from the Coromandel mines. In 1862, however, gold-mining at Coromandel became a settled industry.

Two or three years before there were rumours that shepherds in the mountain districts of Otago, in the South Island, had found gold in certain creeks, but little attention was paid to the rumours until

1862, when alluvial gold was found in considerable quantities in Otago. There was then a rush to the gold fields of that district.

About 1865 gold was discovered on the west coast of the South Island, near Hokitika and the Grey River, and another rush set in. The auriferous deposit was traced to Nelson, and the richness of these discoveries kept the public attention confined to them. Simultaneously with these discoveries in the south, the Maori war raged in the colony, and, as all the gold discoveries then made were on Native lands, the prospect of searching for gold in the North was not encouraging, the Maori lands not being open to settlement.

At the close of the Maori war in the Waikato District, great stagnation of trade prevailed, and the then Provincial Government of Auckland passed an Act offering a reward of £5,000, or $24,000, for the discovery of a gold-bearing district that would give profitable employment to a certain number of people for a certain period of time. The cupidity of the Maori chiefs was aroused, and the chief Taipari, of the Thames district, sent samples of gold and gold-bearing quartz found upon his land to the Government. The result was that on the 1st August, 1867, a Proclamation was issued declaring that certain prescribed territory, the property of Taipari, was open for gold-prospecting to Europeans. On the 17th August, Hunt and party found gold in a ledge of quartz that crossed the Kuranui Creek, and this discovery, which was afterwards known as Hunt's Shotover Mine, made the four original members of the party very wealthy. Discoveries followed each other in rapid succession, and in a few months upwards of 15,000 persons were profitably employed in the district. One mine alone, the Caledonian, distributed among its shareholders within a few months over £600,000, or $2,880,000, in dividends. The shares, which originally cost £12, or $57 60c., ran up in value to £210, or $1,008, at which price they readily changed hands.

In the month of February, 1867, two Californian miners, Hartley and Reilly, made a prospecting tour up the Molyneux River, in Otago, and found gold to such an extent that, as they said themselves, "We had only to place the cradle at the edge of the river and keep it going from morning till night." They brought to Dunedin over 1,000 ounces of gold, and the Provincial Government gave them a bonus of £2,000, or $9,600, for making known the locality of their discovery.

Part of the west coast district of the Middle Island known as Westland is one vast gold field.

In regard to the gold fields of Otago, Dr. Hector, the Colonial Geologist, is of the opinion that the deposits are similar to those occurring in basins upon the western slope of the Rocky Mountains of North America, descending from an elevation of 5,000 feet almost to the sea-level, and extending from California northward into British Columbia.

Vast sums of money have been expended in bringing water from distant streams. The races are miles in length, winding around hillsides which are often tunnelled, or are carried across gullies by flumes or pipes. By means of the water the face of the workings is washed down, and the soil carried away, leaving the gold and gold-bearing rock behind. The gold, being the heaviest part and in small particles, is gathered at the bottom and carefully separated by a process of washing.

Alluvial mining is not now practised so much as formerly. It is gradually being superseded by quartz-mining, which consists of the ordinary process of crushing the rock and extracting the gold by amalgamation with quicksilver. It is estimated that the auriferous gravel of New Zealand extends through an area of country of about ten million acres. The number of miners employed in the gold fields of the colony varies between fourteen and fifteen thousand.

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## THE TIMBER TRADE.

The District of Auckland takes the lead in the timber trade, if, indeed, it is not the seat of the largest timber industry in the Southern Hemisphere. The forests, which are evergreen and contain a variety of valuable woods, are so vast that one may well stand amazed at the thought of the wealth they will yield to the colony. Dr. Hector, who is perhaps the highest authority on this subject in Australasia, states that the forests of New Zealand cover an area of about 20,000,000 acres. The forests on the Crown lands alone are estimated at 10,000,000 acres; about 5,000,000 acres are the private property of the European population, and the remainder is owned by the Maoris.

The country is so well watered, and is so adapted to the growth of timber, that even when the forests are cut down they soon reproduce themselves; but this productiveness is no excuse for the wanton waste which takes place after trees have been cut for timber purposes. Of the timber trees, the kauri pine (*Dammara australis*), one of the most valuable trees in the world, is found only in the District of Auckland, and in that district it does not exist farther south than the East Cape, latitude 37° 30′. Like the cedar of Australia, it is confined to the vicinity of the sea. It loves low, sheltered localities and a wet clay soil. The kauri forests cover about 60,000 acres of Crown land and about 120,000 acres of private property. The tree often grows to a height of 150 feet, and measures from 12 to 30 feet in circumference. Indeed, the kauri is often met with measuring much more than the latter figure. A log which I saw passing through Remuera, near Auckland, was 40 feet long and 5 feet by 5½ feet section. Squared sticks are often got up over 60 feet in length for the keels of vessels. Two trees are known to exist over 20 feet in diameter, one on the East Coast and the other on the Tutamoe Mountains, near Hokianga. This last tree measures exactly one chain (66 feet) in circumference, or 22 feet in diameter. The logs are got out of the bush by rolling or sliding on prepared slip-ways; also loaded on trucks on tramways of wood or iron. Occasionally small locomotives are used. Logs are accumulated in creeks, the waters of which are kept back and suddenly let out during or after a freshet by opening a trap. The logs are then made into rafts and towed to the mill-booms; they are hauled out of the water endways, put into frames, and placed against improved "circular saws," which cut them into boards as fast as a man can walk along the bench.

It was for a long time believed that the kauri pine could not be cut with a deal or gang frame—a theory now exploded. The log, however, frequently nips the saw at starting, and has to be run back to get a new or clear start. Kauri works perfectly into mouldings, planed, matched, and covered forms. An entire house may be built without a single knot. Kauri pine, however, unfortunately shrinks endways if used before being thoroughly dry. In free air, sheltered from the sun, or when put under ground, it is almost imperishable. It is not unfrequently dug out of swamps and about the edges of "foot-hills," where it had been lying for years.

The tree rises to a height of 100 feet without a branch. The cone is nearly round, and when dry falls to pieces. Occasionally kauri trees are discovered with a rugged surface, and on being cut the grain is found to be mottled something after the fashion of bird's-eye maple. The kauri is exported largely in what is called "junk," the logs being squared with an axe, thus wasting a considerable quantity of good timber. The kauri splits well for roofing-shingles. It also splits tolerably well for fence-palings, but is not so good for that purpose as other woods, or the celebrated Tasmanian gum, now being largely imported into New Zealand.

The annual output of kauri timber is about 110,000,000 feet, and the highest estimate that I have seen, from authoritative sources, of the amount of timber in the kauri forests at present known, is 23,000,000,000 feet. The subject of conserving the kauri forests is attracting much attention in the colony, not only on account of the excellent timber it produces, but on account of the gum which exudes from this tree, and which for many years has formed a most valuable article of export in the District of Auckland.

The Secretary for Crown Lands, in one of his reports, expresses the opinion that the best way of utilizing and conserving the forests of the colony would be to induce a rise in the price of timber, but he does not think that the conservancy would be promoted by any artificial rise occasioned by impost or tax, which would produce an opposite effect, as there would be less demand for the timber in the colony and for export, and consequently less inducement to bring it to market. He says, "The rise in price, to operate beneficially, must proceed from the greater demand for the article." With the view of inducing this he has made proposals toward opening a trade with Europe in the timbers of the colony.

Large quantities of rain fall in the District of Auckland, and there is a prevalent idea that the forest produces the rain—an idea based upon the Oriental proverb that "The tree is father to the rain;" but the truth is, the reverse is the case. The rain produces the forests. The forests, however, prevent the water from falling too rapidly over the surface of the earth, check evaporation, and equalize the temperature. The annual average rainfall for the last five years in Auckland is set down by the Government Meteorologist at 40·40 inches, in Dunedin 37·71 inches, and in Wellington 52·92 inches; but, while the rain falls heavier in the latter places, it is more frequent in

Auckland. In the year 1882 rain fell in Auckland on 191 days, in Dunedin on 187, and in Wellington on 166.

The value of the timber trade to the colony has brought the subject of preserving forests very forcibly before the Government, and it is hoped that proper steps will be taken to preserve at least the kauri pine, which is disappearing from New Zealand more rapidly than the famous redwood along the coast of California.

Next to the kauri, the kahikatea, white pine, is the most highly prized as a timber tree. It affects low-lying lands in the vicinity of rivers. There is an immense forest of these trees between the Thames and Piako Rivers, thirty or forty miles in length and several in breadth. The kahikatea is found in the kauri districts, but little attention is paid to it, notwithstanding the fact that its value is becoming very generally known. The wood has a yellowish colour. It is very useful for inside lining, and in spite of its liability to decay it has proved to be an excellent timber for shingling purposes, for roofs made of these shingles have been known to remain sound for a period of ten years.

Totara, a hard close-grained wood, is also used largely. It is a good sound timber, reddish in colour, and very durable; it makes good wharf-piles, telegraph-poles, and railway-sleepers; it has attracted much attention during the last few years from the fact that it has been discovered that if cut during the growing season it will withstand the ravages of the *Teredo navalis*, a sea parasite very common in the Western Pacific.

Puriri is another hard durable wood; it is used largely in the construction of railway trucks and for sleepers; it makes excellent fence-posts, and is smooth and oily. Logs have been cut from it fully 9 feet in diameter. This wood makes excellent furniture, although it is not often used for that purpose. Indeed, there are many valuable trees in New Zealand which could be used for furniture, but the trade is not as yet sufficiently extensive to justify the holding of large stocks of these woods. Rimu, tawiri, rata, and mottled kauri are also used in limited quantities for that purpose.

Another very valuable timber tree is the maire, a native olive. It has a grain resembling the Wallian olive; it is close-grained, hard and oily; the heart is used in saw-mills for bearings instead of brass, and is very durable. It is especially valuable for circular-saw spindle bearings

Pohutukawa is a coast variety of a tree used chiefly by shipbuilders. It is a variety of the rata, which is one of the best-known trees in New Zealand, because branches of it, bearing beautiful brush-like red flowers, are everywhere used during Christmas time for the purpose of decorating houses, churches, &c. It is, in truth, the Christmas-tree, and is used just as people in England and in the United States use the holly and cedar, only it is far more beautiful. South of the equator, where the seasons are reversed, Christmas is celebrated in midsummer, with doors and windows open, or on the lawn, with the broad sunshine streaming over hill and dale. The tree affects rocky cliffs; its leaves are large and thick, of a greenish-blue colour on the outside, and the inside perfectly white. The trunk is gnarled and twisted in every direction. The inland variety of this tree is called the rata. It has not yet been decided whether the rata grows from seed deposited in the forks of high trees, or whether it creeps up from the ground like the ivy. It is often found as a mere thread round the trunks of trees; it thickens and sends out shoots, and winds itself as the ivy does round the oak and other trees. In time the large tree perishes, and the once frail slender growth stands alone with its arms outstretched, embracing the circular space where its decayed supporter stood; and what is perhaps most wonderful is that the stems intertwine and form a hollow tree, with bark inside and out.

The useful and durable timbers of the colony are divided into three classes, of which the following is a table:—

| Systematic Name. | Family. | Native Name. | Settlers' Name. |
|---|---|---|---|
| CLASS I.—*For General Building Purposes.* | | | |
| Dammara australis, *Lam.* | Coniferæ | Kauri | Kauri. |
| Podocarpus totara, *A. Cunn.* | " | Totara | Totara. |
| Podocarpus spicata, *Br.* | " | Matai | Black pine. |
| Libocedrus doniana, *Endl.* | " | Kawaka | Arbor vitæ. |
| Libocedrus bidwillii, *Hook. f.* | " | Pahautea | Cedar. |
| Phyllocladus trichomanoides, *Don.* | " | Tanekaha | Celery-topped pine. |
| Dacrydium colensoi, *Hook.* | " | Manoao | Manoao. |
| Dacrydium westlandicum, *n. s.* | " | | Westland pine |
| Dacrydium intermedium, *n. s.* | " | | Yellow silver-pine. |
| Fagus menziesii, *Hook.* | Cupuliferæ | Tawai | Round-leaved beach. |
| *For Constructive Works or Special Purposes.* | | | |
| Vitex littoralis, *A. Cunn.* | Verbenaceæ | Puriri | N. Z. teak. |
| Fagus fusca, *Hook. f.* | Cupuliferæ | Hutu tawhai | Tooth-leaved beach. |
| Metrosideros tomentosa, *A. Cun.* | Myrtaceæ | Pohutukawa | Pohutukawa. |
| Metrosideros robusta, *A. Cunn.* | " | Rata | Rata. |
| Metrosideros lucida, *Menzies* | " | " | Ironwood. |
| Leptospermum ericoides, *A. Rich.* | " | Rawiri | Tea-tree. |
| Sophora tetraptera, *Aiton* | Leguminosæ | Kowhai | Kowhai. |
| Olea apetala, *Vahl.* | Jasmineæ | Maire raunui | Black maire. |
| Eugenia maire, *A. Cunn.* | Myrtaceæ | Maire tawhake | Maire tawhake |
| CLASS II.—*Timbers adapted for General Building or Special Purposes, but not possessing great Durability.* | | | |
| Dacrydium cupressinum, *Soland.* | Coniferæ | Rimu | Red pine. |
| Podocarpus dacrydioides, *A. Rich.* | " | Kahikatea | White pine. |
| Podocarpus ferruginea, *Don.* | " | Miro | Miro. |
| Fagus solandri, *Hook. f.* | Cupuliferæ | Tawai | Entire-leaved |
| Fagus cliffortioides, *Hook. f.* | " | | [beach. |
| Weinmannia silvicola, *Banks and Sol.* | Saxifrageæ | Towai | Towai. |
| Weinmannia racemosa, *Forst.* | " | Tawhero | Tawhero. |
| Atherosperma novæ-zelandiæ, *Hook. f.* | Monimiaceæ | Pukatea | Pukatea. |
| Elæocarpus dentatus, *Vahl.* | Tiliaceæ | Hinau | Hinau. |

| Systematic Name | Family. | Native Name. | Settlers' Name. |
|---|---|---|---|
| CLASS II.—*Timbers adapted for General Building, &c.*—continued. | | | |
| Elæocarpus hookerianus, *Raoul* | Tiliaceæ | Pokako | Pokako. |
| Nesodaphne tawa, *Hook. f.* | Laurineæ | Tawa | Tawa. |
| Nesodaphne taraire, *Hook. f.* | 〃 | Taraire | Taraire. |
| Alectryon excelsum, *D. C.* | Sapindaceæ | Titoki | Titoki. |
| Ixerba brexioides, *A. Cunn.* | Saxifrageæ | Tawari | Tawari. |
| Tetranthera calicaris, *Hook. f.* | Laurineæ | Mungeao | Mungeao. |
| Knightia excelsa, *Br.* | Proteaceæ | Rewarewa | Honeysuckle. |
| Hedycarya dentata, *Forst.* | Monimiaceæ | Kaiwhiria | Whitewood. |
| Dysoxylum spectabile, *Hook. f.* | Meliaceæ | Kohekohe | Cedar. |
| CLASS III.—*Timbers chiefly of Small Dimensions, but adapted for Various Purposes.* | | | |
| Drimys axillaris, *Forst.* | Magnoliaceæ | Horopito | Pepper-tree. |
| Drimys colorata, *Raoul* | 〃 | 〃 | 〃 |
| Pittosporum eugenoides, *A. Cun.* | Pittosporeæ | Tarata | Tarata. |
| Pittosporum crassifolium, *Banks and Sol.* | 〃 | Kihii | Kihii. |
| Pittosporum tenuifolium, *Banks and Sol.* | 〃 | Kohuhu | Turpentine-tree. |
| Melicytus ramiflorus, *Forst.* | Violaceæ | Mahoe | Mahoe. |
| Plagianthus betulinus, *A. Cunn.* | Malvaceæ | Houi | Ribbonwood. |
| Melicope ternata, *Forst.* | Rutaceæ | Wharangi piro | Wharangi piro |
| Pennantia corymbosa, *Forst.* | Olacineæ | Kaikomako | Kaikomako. |
| Dodonæa viscosa, *Forst.* | Sapindaceæ | Akeake | Akeake. |
| Corynocarpus lævigata, *Forst.* | Anacardiaceæ | Karaka | Karaka. |
| Quintinia serrata, *A. Cunn.* | Saxifrageæ | | Quintinia. |
| Carpodetus serratus, *Forst.* | 〃 | Piripiriwhata | White mapau. |
| Ackama rosæfolia, *A. Cunn.* | 〃 | Makamaka | Makamaka. |
| Leptospermum scoparium, *Frst* | Myrtaceæ | Manuka | Small tea-tree |
| Myrtus bullata, *Banks and Sol.* | 〃 | Ramarama | Ramarama. |
| Myrtus pedunculata, *Hook. f.* | 〃 | Rohutu | Rohutu. |
| Fuchsia excorticata, *Linn. f.* | Onagrarieæ | Kohutuhutu | Fuchsia. |
| Panax crassifolium, *Dec. and Planch.* | Araliaceæ | Horoeka | Lancewood. |
| Griselinia littoralis, *Raoul* | Corneæ | Poukata | Broadleaf. |
| Coprosma arborea, *n. s.* | Rubiaceæ | Karamu | Tree-karamu. |
| Olearia traversii, *Muell.* | Compositæ | Akeake | Akeake. |
| Olearia ilicifolia, *Hook. f.* | 〃 | | Native holly. |
| Olearia dentata, *Hook. f.* | 〃 | | 〃 |
| Dracophyllum latifolium, *A. Cunn.* | Epacrideæ | Neinei | Neinei. |
| Dracophyllum traversii, *Muell.* | 〃 | | Grass-tree. |
| Myrsine urvillei, *A. De C.* | Myrsineæ | Mapau | Mapau. |
| Myrsine salicina, *Heward* | 〃 | Tipau | Long - leaved mapau. |
| Sapota costata, *A. De C.* | Sapoteæ | Pau | Pau. |
| Olea lanceolata, *Hook. f.* | Jasmineæ | Maire | Maire. |
| Olea cunninghamii, *Hook. f.* | 〃 | 〃 | 〃 |
| Santalum cunninghamii, *Hook. f.* | Santalaceæ | 〃 | 〃 |
| Avicennia officinalis, *Linn.* | Verbenaceæ | Maanawa | Mangrove. |
| Myoporum lætum, *Forst.* | 〃 | Ngaio | Ngaio. |
| Persoonia toro, *A. Cunn.* | Proteaceæ | Toro | Toro. |
| Epicarpurus microphyllus, *Raoul* | Urticeæ | Towai | Milk-tree. |
| Phyllocladus glauca, *Carr.* | Coniferæ | Toatoa | Toatoa. |
| Phyllocladus alpinus, *Hook. f.* | 〃 | 〃 | Alpine toatoa. |

The number of saw-mills in the colony is increasing. The number of mills in operation is about 250. In 1879 there were 204, and at that time Mr. Lecoy, in a report to the New Zealand Government, estimated the yearly supply from each of these mills at 1,000,000 superficial feet, or about 200,000,000 superficial feet as the total annual product. The sawn and round timber annually cut out of the forests of the colony would together represent a cubic volume equal to 400,000,000 superficial feet. The average value of sawn timber at Auckland, Wellington, Invercargill, and Dunedin is 13s., or $3 12c., for 100 superficial feet. I give below a table showing the quantity, in detail, and value of timber imported into the Colony of New Zealand for the years 1881 and 1882, with the amount of duty paid on same:—

| Articles. | 1881. | | | 1882. | | |
|---|---|---|---|---|---|---|
| | Quantity imported. | Value. | | Quantity imported. | Value. | |
| | | £ | $ | | £ | $ |
| Timber— | | | | | | |
| Deals .. .. | 335,561 ft. | 2,567 | 12,322 | 734,482 ft. | 6,271 | 30,101 |
| „ .. .. | .. | .. | .. | 5,527 „ | 35 | 168 |
| Laths .. .. | 285,833 No. | 324 | 1,555 | 1,211,720 No. | 1,592 | 7,642 |
| Logs .. .. | 3,923 „ | 10,207 | 48,994 | 2,627 „ | 7,797 | 37,426 |
| Palings .. | 1,471,905 „ | 9,152 | 43,930 | 1,212,940 „ | 8,410 | 40,368 |
| Posts .. .. | 17,475 „ | 481 | 2,309 | 15,951 „ | 532 | 2,554 |
| Rails .. .. | 56,976 „ | 1,781 | 8,549 | 33,295 „ | 1,091 | 5,237 |
| Sawn, undressed | 3,684,817 ft. | 26,385 | 126,648 | 4,373,438 ft. | 33,132 | 159,034 |
| „ „ | 217,937 „ | 2,109 | 10,123 | 5,800 „ | 30 | 144 |
| „ dressed | 154,815 „ | 1,067 | 5,122 | 281,668 „ | 1,852 | 8,890 |
| Shingles .. | 3,991,140 No. | 2,601 | 12,485 | 2,731,425 No. | 2,039 | 9,787 |

The subjoined table shows the quantity and value of timber exported from New Zealand during the years 1881 and 1882:—

| Articles. | 1881. | | | 1882. | | |
|---|---|---|---|---|---|---|
| | Quantity. | Value. | | Quantity. | Value. | |
| | | £ | $ | | £ | $ |
| Laths .. .. | .. | .. | .. | 71,900 No. | 51 | 245 |
| Logs .. .. | 1,709 No. | 6,184 | 29,683 | 5,635 „ | 20,105 | 96,504 |
| Palings .. .. | 600 „ | 6 | 29 | 3,600 „ | 39 | 187 |
| Sawn, undressed.. | 7,133,926 ft. | 29,573 | 141,950 | 7,825,408 ft. | 39,963 | 191,822 |
| „ dressed .. | 6,046,394 „ | 35,596 | 170,861 | 8,661,493 „ | 54,530 | 261,744 |
| Shingles .. .. | 26,000 No. | 19 | 91 | 26,500 No. | 12 | 58 |
| Firewood .. .. | 48 tons | 22 | 106 | 103 tons | 45 | 216 |
| Other kinds .. | 2,965 pkg. | 2,526 | 12,125 | 5,951 pkg. | 4,595 | 22,056 |

The duty charged on sawn timber imported into the colony is 2s., or 48 cents, per 100 superficial feet, and on sawn dressed timber 4s., or 96 cents, per 100 superficial feet. The duty on shingles and laths, per 1,000, is 2s., or 48 cents; on palings, 2s., or 48 cents, per 100; on posts, 8s., or $1 92c., per 100; and on rails, 4s., or 96 cents, per 100. The duty, however, bears very heavily upon certain American timber for which there is no good substitute in New Zealand. For instance, large quantities of the American yellow pine are used in the colony. Among the many uses to which this pine is applied is that of making ferrules for surface-condenser tubes. Indeed, for this purpose no other timber can be compared to it, the wood being soft, compressible, and not warping or shrinking. For these ferrules the wood has to be compressed by being forced through a die, while a tapered mandrel is passed through the centre. The water coming in contact with the ferrule expands its substance, causing it to make a steam-tight joint.

The saw-mills of New Zealand appear to be doing a thriving business. One of the most extensive industries of the kind in the colony is the Auckland Timber Company's mills and works. This company was established in December, 1877. It was formed out of the business of Mr. George Holdship, the present managing director. Mr. Holdship began the timber business in the colony over twenty years ago, and all his ideas about it are eminently broad and practical. When the Auckland Timber Company was established its capital was about £60,000, or $288,000. It has since been increased to £120,000, or $576,000, of which £80,000, or $384,000, has been subscribed. It is divided into 24,000 shares, at £5, or $24, each. The company owns some very valuable property, part of which consists of kauri forests acquired years ago, long before the great value of this grand timber became fully understood, and of course purchased at a very small price. The timber lands now in possession of the company are so extensive that, even at the present rate of consumption, years will elapse before a new supply will be needed. At Whangaroa the company has a double saw-mill, complete, together with freehold, leasehold, and agreements for extensive forests; at Port Charles, a single saw-mill, with freehold and leasehold forests; at Kennedy's Bay, a saw-mill and forests. In addition to the above, there are about 5,000 acres of freehold forest land at Mangonui, with an excellent mill site, on which the company propose to erect a mill. At these mills and in the creeks, ready to be floated out by freshets, they have a supply of over 12,000,000 feet of log timber, which they are capable of converting into sawn timber at the rate of about 170,000 feet per week. These properties are situated at points along the East Coast affording every facility for carrying on an extensive business in timber. In Auckland there are the sash and door manufactories at Newton and in Customhouse Street. These include the lease, for sixty-six years, of 500 feet of water frontage on the reclaimed land in Auckland Harbour, on which the company has erected a series of splendid buildings, surpassing anything of the kind in the Southern Hemisphere. The buildings cover an area of about 1¼ acres. The main building is three storeys in height, and contains every possible kind of woodworking machinery of the latest and most improved English and American manufacture. This machinery is driven by six steam-engines, the largest of which is a pair 20-inch cylinder, high pressure. The total weight of machinery, engines, shafting, gear, &c., is from 700 to 800 tons, and the total length of shafting about 700 feet. In addition to the working machinery, the company does most of its own engineer work, and has therefore fitted up forges, engineers' lathes, drilling, planing, and shaping machines, and other necessary plant for this department. The number of hands employed is about 500. Vessels load and unload alongside the company's wharf. The offices and store are built of brick in the most substantial manner, with five floors, each having an area of about 5,000 feet. An elevator, 9 feet square, runs from bottom to top, worked by a steam-engine, which is also used to drive a putty-mill and other machinery.

## THE IRON AND STEEL TRADE.

Very few persons outside of New Zealand are aware of the vast extent of the iron and steel trade of this colony. Indeed, the demand for all kinds of iron and steel is so great that the value of the imports, exclusive of machinery, steam-engines, and ironmongery (hardware), during the year 1882 reached the sum of £551,736, or $2,648,338, against £440,880, or $2,116,224, for 1881, showing an increase of £110,856, or $532,114, for 1882. The value of the imports of machinery, steam-engines, and ironmongery during the same period also showed a corresponding increase, and reached the sum of £459,210, or $2,224,208. The following table gives the quantity and value of the imports of the various kinds of iron and steel into the Colony of New Zealand for the years 1881 and 1882:—

| Kind. | Quantity. | Value. | |
|---|---|---|---|
| | Year 1881. | | |
| | | £ | $ |
| Angle iron ... ... | Tons 36 | 350 | 1,680 |
| Bar, bolt, and rod ... ... | „ 7,181 | 57,455 | 275,784 |
| Bolts and nuts ... ... | „ 262 | 5,005 | 24,024 |
| Castings ... ... ... | „ 28 | 530 | 2,544 |
| Galvanized (corrugated) ... | „ 6,461 | 128,455 | 616,584 |
| Galvanized (plain sheet) ... | „ 805 | 16,591 | 79,636 |
| Gates and posts ... ... | „ 1 | 47 | 225 |
| Hoop iron ... ... | „ 629 | 5,749 | 27,595 |
| Pig iron ... ... ... | „ 2,832 | 10,574 | 50,755 |
| Pipes (cast) ... ... | „ 6,148 | 46,903 | 225,134 |
| Pipes (wrought) ... ... | „ 299 | 3,742 | 17,961 |
| Plate ... ... ... | „ 508 | 4,975 | 23,880 |
| Railway bolts, &c. ... ... | „ 229 | 2,654 | 12,739 |
| Sheet ... ... ... | „ 434 | 4,959 | 23,803 |
| Tanks ... ... ... | No. 2,136 | 7,600 | 36,480 |
| Wire (fencing) ... ... | Tons 6,126 | 81,697 | 392,145 |
| Wire (telegraph) ... ... | „ 43 | 1,145 | 5,496 |
| Wire (for reapers and binders) | „ 377 | 15,701 | 75,364 |
| Steel ... ... ... | „ 305 | 4,791 | 22,996 |
| Steel rails ... ... | „ 6,609 | 41,957 | 201,393 |

| Kind. | Quantity. | Value. | |
|---|---|---|---|
| Year 1882. | | | |
| | | £ | $ |
| Angle iron ... ... | Tons 60 | 573 | 2,750 |
| Bar, rod, and bolt ... ... | „ 7,600 | 63,630 | 305,424 |
| Bolts and nuts ... ... | „ 442 | 10,924 | 52,435 |
| Castings ... ... ... | „ 82 | 1,294 | 6,211 |
| Galvanized (corrugated) ... | „ 7,778 | 157,275 | 754,920 |
| Galvanized (plain sheet) ... | „ 1,028 | 22,112 | 106,137 |
| Gates and posts ... ... | „ ½ | 22 | 105 |
| Hoop iron ... ... | „ 745 | 6,926 | 33,244 |
| Pig iron ... ... ... | „ 4,272 | 14,130 | 67,824 |
| Pipes (cast) ... ... | „ 2,426 | 22,329 | 107,179 |
| Pipes (wrought) ... ... | „ 577 | 9,206 | 44,188 |
| Plate ... ... ... | „ 912 | 11,652 | 55,929 |
| Railway bolts, &c. ... ... | „ 354 | 3,233 | 15,518 |
| Sheet iron ... ... | „ 747 | 8,800 | 42,240 |
| Tanks ... ... ... | No. 2,381 | 8,763 | 42,062 |
| Wire (fencing) ... ... | Tons 10,452 | 150,223 | 721,070 |
| Wire netting ... ... | „ 616 | 7,930 | 38,064 |
| Wire (telegraph) ... ... | „ 1 | 41 | 196 |
| Wire (for reapers and binders) | „ 431 | 17,172 | 82,425 |
| Steel ... ... ... | „ 211 | 5,940 | 28,512 |
| Steel rails ... ... | „ 3,207 | 23,687 | 113,697 |
| Other kinds ... ... | „ 288 | 5,875 | 28,200 |

The cost of iron here varies according to the supply and demand. The price of bar and rod is from £9, or $43 20c., to £13, or $62 40c., per ton, according to quality. Castings are £14, or $67 20c., per ton; staples, from £20, or $96, to £28, or $134 40c.; standards, from £12, or $57 60c., to £14, or $67 20c.; galvanized iron, from £23, or $110 40c., to £27, or $129 60c.; plate iron, from £12, or $57 60c., to £13, or $62 40c.; steel rails, from £8, or $38 40c., to £10, or $48, per ton. Nearly all the iron used here, with the exception of a small quantity of American castings, bolt and rod iron, nuts, and hoop iron, comes from England, where, on account of the low price of labour, the close proximity of the mountain limestone used as a flux, and the interstratification of coal and iron, it can be produced cheaper than in the United States. Moreover, it is said that the coal deposit of Great Britain is about one-tenth of the whole area of the kingdom, while that of the United States is only one-seventeenth of her territory. Of course the percentage is larger in some of the States, for instance, Pennsylvania, where there is nearly 16,000 square miles of anthracite, but, instead of being interstratified with iron, as in England, it usually lies at a considerable distance therefrom. England, however, may be said to have reached the acme of her iron production, while in the United States the industry is comparatively a new one, but it is an industry that is reaching vaster proportions every year. The castings brought here from the United States are admitted by every one to be much neater and in every way better adapted to the trade than those brought from England.

Iron rails are out of use in the construction of railways here as well as in the United States. In fact, all the iron rails in New Zealand are gradually being replaced by Bessemer steel ones. The price of the latter is very low here. There also appears to be a steady decline in the cost of steel rails in the United States. The last quotations there were as low as £8 per ton, or $38 40c., although some manufacturers contended that the price was only a temporary one: that these rails were put down by one of the manufacturing companies at a fictitious price in order to secure a readjustment of the cost and values on a solid basis. The demand for Bessemer steel rails, it is reasonable to believe, will steadily increase for some years to come, not only in New Zealand, but in all the Australasian Colonies. During the year 1883 16,000 tons of steel rails were imported for the colonial railways. There are now 1,462 miles of railway open in New Zealand, and 171 miles more in the course of construction. In Victoria there are 1,355 miles of railway open, while New South Wales has 1,313 miles and is constructing 504 miles more. The total number of miles of railway open in all the Australasian Colonies is 6,204, and in construction 1,557. Moreover, new railways are being projected in every one of the colonies.

The duties charged on iron imported into New Zealand are moderate, and many articles, such as bar, rod, bolt iron, screws, castings, bridges, iron and steel rails, and all material for the construction of bridges, wharves, jetties, or patent slips are admitted free, as are all kinds of machinery, steam-engines, boilers, &c. Wire fencing, however, is taxed at 1s., or 24 cents, per cwt., and so are standard straining-posts and apparatus. Gates and gate-posts are taxed at 4s., or 96 cents, per cwt.; corrugated sheets, guttering, ridges, spouting, &c., are 2s., or 48 cents, per cwt.; nails are 2s., or 48 cents, per cwt.; tanks are 5s., or $1 20c., each, (if of 200 gallons and under, the duty is 2s. 6d., or 60 cents, each). The duty on ironmongery or hardware is 15 per cent. ad valorem; iron safes are also 15 per cent. ad valorem.

The cost of freight on iron from New York by sailing-vessels is £1 10s., or $7 20c. per ton measurement, and from San Francisco, *viâ* Pacific Mail Steamship Company, it is £3, or $14 40c. Ironmongery or hardware, including iron safes, is £3 12s., or $17 28c., per ton; the ton being either 40 cubic feet or 2,240 lb.

There are thirty-five iron and brass foundries in New Zealand, all of which are doing a prosperous business. Of these, ten are located in the District of Auckland, six in Wellington, one in Nelson, one in Westland, five in Canterbury, one in Hawke's Bay, one in Marlborough, and ten in Otago. Nearly one thousand hands are constantly employed in these foundries. The total value of the grounds and buildings connected therewith is £83,581, or $401,189. The total value of the machinery and plant is £71,686, or $344,093. The average wages of the engine- and boiler-makers employed in these foundries is from 10s., or $2 40c., to 12s., or $2 88c., per day. These foundries, and especially those in the large cities, are capable of repairing and manufacturing all kinds of boilers and engines, and of putting together iron ships of any size.

The mineral resources of New Zealand are so vast and varied that they cannot be easily over-estimated. The supply of coal is boundless, and vast deposits of iron ores are scattered throughout both the North and South Islands.

The following are some of the most important forms of iron found in the colony: Hæmatite, from veins in the schistose and crystalline rocks; magnetic iron oxide, from the schistose rocks and from various igneous rocks of recent origin; argillaceous iron ores, from the various coal-bearing formations, are found in great abundance. Hæmatite occurs in large quantities in serpentine rocks near Nelson. At Parapara, Nelson, vast quantities of brown-hæmatite ore occur on the surface of the ground. Some of this was recently converted into iron at Melbourne, and gave the following analysis:—

| | |
|---|---|
| Iron ... ... ... ... ... | 97·668 |
| Manganese ... ... ... ... | ·268 |
| Carbon combined ... ... ... | ·542 |
| „ free (graphite) ... ... ... | ·208 |
| Silicon, with titanium traces ... ... | 1·004 |
| Phosphorus ... ... ... ... | ·040 |
| Sulphur ... ... ... ... | ·270 |
| | 100·000 |

Its colour is uniform, approaching white, structure homogeneous and finely granular, hard and brittle. On the west side of Mount Peel a deposit has been discovered fully 60 feet thick. The ore contains 36 per cent. of metallic iron, and has been traced for a distance of three miles, and beyond that point it is said by diggers to swell out more than a mile in width. Specular iron ore is found at Dun Mountain, Nelson, and at Maori Point, Shotover, Otago, both veins being very rich. At Dun Mountain there is also a vein 16 feet of magnetic iron ore in serpentine slates. At Lake Wakatipu there is a rich vein of the same ore, and another at Maramara, Frith of Thames. That at Maramara contains oxides of titanium and manganese. Spathic iron ore occurs in large quantities in the district of Collingwood, more or less oxidized with the coal seams of that district. One form of this ore, known as the black-band ore, containing 70 per cent. of iron, is found at Wyndham River, Otago, and at the Manukau Harbour, Auckland, formed by the black layers becoming cemented with hæmatite. The following is an analysis of hæmatite ore from Raglan, District of Auckland:—

| | |
|---|---|
| Sesquioxide of iron ... ... ... | 7·269 |
| Oxide of manganese ... ... ... | ·031 |
| Alumina ... ... ... ... | ·202 |
| Magnesia ... ... ... ... | ·069 |
| Lime ... ... ... ... ... | ·058 |
| Sulphide of iron ... ... ... ... | ·011 |
| Hygroscopic water ... ... ... | ·461 |
| Constitutional water ... ... ... | 1·302 |
| Silicates undecomposed by acids ... ... | ·597 |
| | 10·000 |

| Locality. | Matrix from whence probably derived. | Magnetite. | Hæmatite. | Titanite. | Per c'nt of Iron. |
|---|---|---|---|---|---|
| Upper Buller River, Nelson.. | Hornblende rocks .. | 87·5 | 9·4 | .. | 70·2 |
| Lower Buller River, Nelson.. | Tertiary gold drift of diorite slate* | 54 | .. | 42·3 | 59 |
| Upper Molyneux River, Otago | Mica-schist* .. .. | 82·7 | .. | 9·7 | 65·9 |
| Lower Molyneux River, Otago | Mica-schist and Tertiary strata† | 74·4 | .. | 2·5 | 58· |
| Mountain Stream, Canterbury | Palæozoic slates .. .. | 62·7 | 37·2 | .. | 66· |
| Mountain Stream, Otago .. | Palæozoic slates* .. | 86·1 | 10·5 | .. | 58· |
| Tuapeka, Otago .. .. | Old gold drift* .. .. | 2·2 | 92·8 | .. | 63·8 |
| Wakatipu, Otago .. .. | Mica-schist* .. .. | 80 | 7·6 | .. | 52·9 |
| Mataura River (Upper) .. | Diorite slate .. .. | 9·8 | .. | 70·9 | 41·2 |
| Mataura River (Upper) .. | Old gold drift .. .. | 63·5 | 16·1 | 8 | 60·6 |
| Stewart Island .. .. | Granitic rocks, with greenstone dykes* | 77·8 | .. | 20·1 | 57·3 |
| Stewart Island .. .. | Hornblende rocks* .. | 71·5 | 20 | 8·2 | 70·1 |
| Anatoke, Nelson .. .. | Granite and hornblende* | 79·8 | 7·7 | 3·4 | 60·2 |
| Mahinepoa Lake .. .. | River-drift from diorite rocks‡ | .. | .. | 58 | 29·1 |
| Sea-beach, Hokitika .. .. | Sea and drift* .. .. | 75 | .. | | 54 |
| Motueka River, Nelson .. | Tertiary strata and granite* | 33 | 32·5 | | 40 |
| Wairau River, Marlborough | Tertiary strata and granite-schist* | 21 | 48·4 | | 38·9 |
| Wanganui River, Nelson .. | Granite and Tertiary* .. | 54 | 13 | | 43·2 |
| Saddle Hill, Otago .. .. | Basaltic | 58·3 | .. | 25·6 | 52·9 |
| Green Island, Otago .. .. | Basaltic or sea-beach .. | 53·3 | .. | 29·6 | 50·3 |
| Hooper Inlet .. .. .. | Basaltic or sea-beach .. | 20 | 74·2 | | 53 |
| West Bluff, Southland, Foveaux Strait | Diorite or sea-beach§ .. | 12·2 | .. | 40·6 | 28·6 |
| D'Urville Island, Nelson .. | Diabase and granite‖ .. | 78·6 | .. | .. | 57·4 |
| Taranaki beach .. .. | Trachyte .. .. .. | 91·9 | .. | 6·2 | 70·1 |
| Taranaki beach .. .. | Trachyte¶ .. .. | 71 | .. | 8 | 56·1 |
| Tauranga beach .. .. | Trachyte .. .. .. | 87·4 | .. | .. | 68 |

I am indebted to Dr. James Hector, the Colonial Geologist, for the above valuable information and table.

There are large deposits of iron ores on the Bridgwater Estate, in the Waikato District, among which are the following: Hæmatite with clay bands attached, Blueflats iron ore, Gubbins stone ore, and diamond stone ore. The hæmatite is of a hard nature, and is from 8 to 10 inches in bands, and estimated to be 3 feet 6 inches to 4 feet in the aggregate. The Blueflats ore is very rich and of a softer nature than the hæmatite, and is very abundant. Mr. W. J. Dalton, civil engineer, of Auckland, in a valuable paper on the Bridgwater Estate, says there are about 100 acres of the property where the blast has apparently burst out and formed large ridges with masses of nearly pure iron. From the quality of the ore and the facilities for working it, he predicts that the people of Auckland will not long be dependent on foreign markets for this metal.

Although no systematic effort has ever been made to develop the iron mines of the colony, vast sums of money have been expended in energetic and persistent efforts to utilize the extensive deposits of ironsand scattered along the west coast of the North Island and the east coast of the South Island. This sand is also found in quantities along the coast of Stewart Island, and in nearly all the creeks and rivers of the country. At New Plymouth, in the District of Taranaki, the supply is absolutely unlimited, and can be counted by millions of tons. It fringes the entire western coast of the North Island for a distance of several hundred miles; indeed, all the way from Mount Egmont to Ahipara, north of Hokianga. It is formed, doubtless, by the action of the waves of the sea on the volcanic rocks, which are largely charged with iron. The rocks are gradually worn away by the continued trituration of the water, and the heavy ironsand is separated from the lighter material and heaped up along the coast. The sand in the rivers and creeks has been washed there from the cliffs by the rain. In many parts, after heavy showers, it is no uncommon thing to find this sand glistening along the roads. In order to form something like a fair estimate of the magnitude of these ironsand deposits, I will mention that on some parts of the beach, for instance north of Waiuku, District of Auckland, the area of this sand extends miles in width toward the interior of the Island, submerging rocks and trees and shrubs, in fact, everything within its reach.

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* Auriferous. † Auriferous, with 12 per cent. of glauconite. ‡ Auriferous, with garnets, topaz, disthene, &c. § Auriferous and platiniferous. ‖ Chrome iron. ¶ Olivine and hornblende.

A few years ago a small quantity of this magnetic sand was sent to England, where it was manufactured into steel cutlery. It consists of peroxide and protoxide of iron mixed, and yields from 50 to 70 per cent. of the finest quality of the metal.

The existence of this sand was known to traders and masters of sailing-vessels long before the establishment of the British Government in New Zealand. On approaching the shore the masters of vessels that first visited these Islands noticed a great deflection in the mariner's compass, for which they were wholly unable to give a satisfactory explanation. At that time the Maoris, or aboriginal inhabitants, were so fierce and warlike that it was not safe for Europeans to leave their ships for the purpose of examining the shore. Some of the officers of the ships expressed the opinion that the deflection of the compass was caused by large deposits of loadstone along the beach. When the intercourse between the Europeans and Natives became more frequent this idea was abandoned, and a satisfactory reason was found in the discovery of the fine particles of iron mixed with sand along the beach.

The sand from the Upper Buller River, District of Nelson, is found to contain the largest percentage of iron. The next largest is that found on the Taranaki beach; then follows the sand found in Mountain Stream, District of Canterbury, and that of the Upper Molyneux River in Otago. All of it is more or less auriferous. That at the Lower Molyneux River is auriferous, with 12 per cent. of glauconite. The sand at West Bluff, Foveaux Strait, is charged with gold and platinum.

The cause of the repeated failures in the attempts to make iron and steel out of the magnetic sand in New Zealand is doubtless the old-fashioned mode of working. Various attempts have been made with the blast furnace by mixing the ironsand with calcareous clay, but the molten iron could not be made to run. After these failures, and upon inquiry, it was found that the United States Government had granted as many as thirty-eight different patents for electric ore-separators, including two patents granted to T. A. Edison, the celebrated inventor. It was also learnt that iron and steel were manufactured on a large scale by D. C. McArthur from the ironsand obtained at Block Island, New Jersey, and that he was able to clean 120 tons of sand per day, the separation being done by means of magnets. The ore is placed in bags and shipped to Rockaway, New Jersey, where it is mixed with finely-ground charcoal and put into the furnace. Ten tons are heated at a time to a red heat, and kept at a red heat until let down into the puddling furnace, and then worked into blooms, being afterwards hammered into square and oblong blocks.

A furnace on the American plan has been erected at Onehunga, about six miles from Auckland, by Messrs. Gardner and Chambers. It was opened to the general public on the 8th February, 1883. The furnace used is the invention of Joel Wilson, of New Jersey. It was first patented in the United States, but patents have been secured for it in all the Australasian Colonies. The managers claim that they can manufacture iron in Auckland much cheaper than it can be brought from England. Mr. Jones, of Philadelphia, who is working the furnace at Onehunga, offered to make pig-iron at £4, or $19 20c. per ton, the present market value being £5 10s., or $26 40c. per ton. The managers have made a series of experiments with New Zealand coal for the purpose of finding a substitute for charcoal, the high price of which here interferes materially with the economical manufacture of iron. These experiments, it is said, have resulted in the discovery that the slaked coal from the Taupiri Coal-mine, in the Waikato District, answers the purpose much better than any other kind of coal, and in some respects it is even better than charcoal, as it does not require to be ground, and burns at a red heat, leaving a pure, clean, white ash. The managers expect to have ten furnaces in operation shortly.

The Government of New Zealand has taken great interest in the development of the iron mines, and offers a bonus of £1,000, or $4,800, to any one who will make in this colony the first 200 tons of iron blooms out of New Zealand ore.

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## WATCH AND CLOCK TRADE.

The introduction of American watches and clocks into New Zealand is of recent date. They have, however, become so very popular and so generally in use that the trade in them bids fair to swell to large proportions.

These goods usually arrive here by way of London, instead of coming direct from the United States, and on that account I have no means of determining the exact value of United States imports. The reason given by the American manufacturers for not sending direct, instead of by way of London, is the frequency of communication between the latter city and New Zealand. There has been, however, during the last few years, a steady increase in the direct shipments of these goods from the United States to this colony, and there is reason to believe that these shipments will be still further increased.

The vessels which arrive in this colony from the Atlantic ports of the United States come only at irregular intervals, and scarcely ever direct to one port; but, since the establishment of lines of sailing-vessels at Boston and New York, the communication between those cities and Auckland has been more frequent and regular.

The extent to which American watches and clocks are advertised in New Zealand is extraordinary. There is scarcely a jeweller's shop in Auckland, Wellington, Napier, Christchurch, Dunedin, and Invercargill, that has not signs bearing the inscription, "American watches and clocks for sale."

A leading jeweller in Auckland said to me: "It is difficult to sell an English watch, and, as far as the Geneva watches are concerned, they are being fast driven from the market. Everybody wants an American watch. I am not prepared to say that American watches are any better than other watches, but it is the fashion to have them. There is not a boy or servant-girl in the country who can raise enough money who does not want an American watch."

I give below a table showing the value of watches and clocks imported into New Zealand for each year since 1871:—

| | From United Kingdom. | | | From Australia. | | | From United States. | | | Totals. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pkgs. | Value. | | Pkgs. | Value. | | Pkgs. | Value. | | Pkgs. | Value. | |
| | | £ | $ | | £ | $ | | £ | $ | | £ | $ |
| 1871 | 315 | 3,086 | 14,813 | 163 | 1,225 | 5,880 | 303 | 968 | 4,646 | 781 | 5,279 | 25,339 |
| 1872 | 455 | 3,688 | 17,702 | 311 | 3,968 | 19,046 | 66 | 248 | 1,190 | 832 | 7,904 | 37,939 |
| 1873 | 347 | 4,602 | 22,090 | 303 | 5,498 | 26,390 | 625 | 1,303 | 6,254 | 1,275 | 11,403 | 54,734 |
| 1874 | 516 | 8,536 | 40,973 | 183 | 6,560 | 31,488 | 976 | 3,230 | 15,504 | 1,675 | 18,326 | 87,965 |
| 1875 | 536 | 10,394 | 49,891 | 203 | 8,859 | 42,523 | 1,960 | 6,147 | 29,506 | 2,699 | 25,400 | 121,920 |
| 1876 | 700 | 14,385 | 69,048 | 100 | 5,472 | 26,266 | 2,216 | 6,475 | 31,080 | 3,016 | 26,332 | 126,394 |
| 1877 | 427 | 9,423 | 45,230 | 104 | 7,610 | 36,528 | 468 | 1,638 | 7,862 | 999 | 18,671 | 89,621 |
| 1878 | 562 | 13,748 | 65,990 | 158 | 9,197 | 44,146 | 623 | 2,256 | 10,829 | 1,343 | 25,201 | 120,965 |
| 1879 | 620 | 16,708 | 80,198 | 107 | 7,683 | 36,878 | 1,205 | 7,315 | 35,112 | 1,932 | 31,706 | 152,189 |
| 1880 | 3,882 | 8,741 | 41,957 | 759 | 2,522 | 12,106 | 4,984 | 3,668 | 17,606 | 9,625 | 14,931 | 71,669 |
| 1881 | 8,524 | 12,323 | 59,150 | 2,997 | 5,288 | 25,382 | 8,114 | 3,972 | 19,066 | 19,635 | 21,583 | 103,598 |
| 1882 | 15,085 | 26,938 | 129,302 | 3,511 | 6,521 | 31,301 | 7,239 | 3,870 | 18,576 | 25,835 | 37,329 | 179,179 |

N.B.—The large increase in the numbers for packages after 1879 is caused by the actual number of clocks and watches being given for the following years, instead of the number of packages and cases, as in the previous years.

It will be seen from this table that a large number of watches and clocks arrived in New Zealand *viâ* Australia. There was a marked falling-off in the imports of these goods in 1880, on account of the financial depression in the colonies during that year. There was also a decrease in the quantity and value of all kinds of imports. The revival of trade, however, began in the spring of 1881, and has kept up steadily ever since. The value of both the imports and exports of New Zealand for 1882 was greater than that of any previous year.

The Customs returns make no distinction between gold and silver watches, and I am therefore unable to give the exact value of each kind. The duty charged on them is the same—viz., 15 per cent. ad valorem. The value of silver watches imported into New Zealand is in excess of that of gold, and it would be safe to set down the number of silver watches sold here at fully four times the number of gold watches.

I frequently have opportunities of examining the stocks of wholesale and retail dealers in watches, not only here, but in Dunedin and Christchurch; and it is gratifying to me to find among them such large assortments of American watches. The most notable thing about the American watches, next to their cheapness or economy of production, is their neat and tasteful appearance; indeed, some of the American chronometers that I examined impressed me as being the most beautiful pieces of mechanism that I ever beheld in my life; and I will mention here that my opportunities for observing this kind of work have been considerable, and especially so during my residence as United States Consul at Copenhagen, where I had the pleasure of paying frequent visits to the factory of Jourgensen, one of the most celebrated watchmakers in the world. I had also opportunities of studying the unique display of watches in the chronological collection of the Danish Kings in Rosenberg Castle, at Copenhagen, and also the collection of watches in various other museums in Europe.

Although my attention has only lately been directed to the Waltham watches, I am of opinion that they surpass all others in the simplicity of their construction. Another feature that cannot be commended too highly is that they are made with such perfect exactitude that the parts of all watches of the same class can be interchanged. These and other points of excellence have made them very popular in the Australasian Colonies, but it must be borne in mind that this popularity is of recent date in New Zealand, and that at present it is confined principally to the cheaper classes of watches, and that there is still a strong prejudice on the part of those who are considered competent judges here against the American article. Indeed, very few are even inclined to regard the gold and silver cases of American watches as genuine unless they have received the British Hall-mark, which guarantees that they are made of gold or silver. On account of this prejudice watchmakers in the United States have their cases made in London, or else send them there for the purpose of receiving the Hall-mark. Nearly all colonists understand the significance of the Hall-mark, but only the progressive and cultured class place equal faith in the guarantee certificates of well-known American firms that the accompanying cases are warranted sterling silver or 18-carat gold, United States Mint assay. American cases of the Waltham Watch Company are, however, gradually forcing their way into this market, and I do not doubt that they will soon supersede those made in Europe.

The prestige given to the American watches at the International Exhibitions held successively at Paris, Sydney, and Melbourne has done much towards overcoming the opposition which the American manufacturer has to contend with.

Mr. Donald Manson, the manager of the Australian agency of the American Watch Company of Waltham, Massachusetts, has recently made me acquainted with some of the difficulties he had to encounter in the introduction of the Waltham watches into this market. He describes the opposition to his company as stronger than that encountered in any other new field of labour. He said: "The inherent belief which the New-Zealander had in the old hand-made English lever watch was so strongly embedded that very few entertained any hopes of the company's products ever getting a foothold in this colony." It was a matter of unremitting toil for years before he could extend the sale of the company's watches. Indeed, it would seem that nothing but a spirit of indomitable perseverance could ever have fought down so successfully the stronghold barriers of trade Connections which the continental markets had established here.

The success which the Waltham watch achieved at the International Exhibitions at Sydney in 1879, and at Melbourne in 1880, was certainly of a triumphant character. Much praise had been bestowed upon the Waltham watch by the Press of Europe and America, and it was well known that it carried off the gold medal at the Paris Exhibition of 1878, the highest prize bestowed upon the exhibitors of watches, and that it was given by eleven international jurors, only one of whom was an American; but this success, while very gratifying to Americans, was the means of strengthening the opposition to our watches at the Sydney Exhibition. Indeed, at Sydney the Waltham watch had to contend against the watches of six famous British manufacturers (including those of Victor Kullberg, T. Russell and Sons, and Nicole and Nillsen); two German, H. Lange and Sons, Dresden, and the Wurtemberg Watch Factory, Schwarzwald; and two celebrated French manufacturers, A. H. Rodanet, Paris, and G. Fribandeau, Besançon. The Commissioners unquestionably exercised great care, and, after repeated tests by Professor H. C. Russell, Astronomer Royal at the Sydney Observatory, awarded the only gold medal to the American (Waltham) Watch Company, and in addition three special and four first prizes, one of the latter being an award for the improvement in cases, the number of artistic forms and designs used, the beauty and elegance of their finish, and for their new and indestructible method of enamelling.

At Melbourne the Waltham Company had a much keener competition than at Sydney; but there, as at other places, finally succeeded in distancing all their competitors, and received two gold medals: one for their pre-eminence in horological science, and the other for their superiority in art workmanship.

The Waltham Company thus far have not only produced a better watch than any of their competitors, but at the same time they have produced a much cheaper one. They have succeeded in a marked degree, by means of their improved compensated balance, in overcoming the difficulties of expansion and contraction occasioned by changes of temperature. It is well known that a rise in the temperature adds to the length of the spring of the watch, and thereby diminishes its elasticity. This change is occasioned by the expansion of the balance, which augments its moment of inertia. The elastic portion of a spring varies inversely according to the length and the time of the vibration of the balance. If the inertia is increased and the elastic portion of the spring weakened, the watch must necessarily go slower, but when there is a fall in the temperature the action is reversed, and the watch goes more rapidly. It would not have been possible for the Waltham Company to overcome these obstacles without the application of machinery—an improvement upon the old method due solely to American inventive genius, and to which the highest scientific authorities in the known world have rendered tribute ungrudgingly. Some idea of the advantages derived from the use of automatic machinery can be formed from the statement that the delicacy of construction of the mechanism invented by the Waltham Company is such that a micrometer which they exhibited at Paris measured the twenty-five thousandth part of an inch, and might readily be divided under a lens.

## WINE AND SPIRIT TRADE.

There were imported into the Colony of New Zealand during the year 1882 588,327 gallons of spirits, against 573,267 for the year 1881. The duty paid on spirits for last year amounted to £412,984, or $1,982,323, against £573,267, or $2,751,682, for the year 1881. Rum, whiskey, and brandy are the spirits mostly in use.

*Scotch and Irish Whiskeys.*—The whiskeys generally used are Scotch and Irish, and of the former the favourite brands are Lorne, Campbelltown, Islay, and Royal Blend. The favourite brands of Irish whiskeys are Thomas Dunville's, John Jameson and Son's, and Kinahan's LL. The price of Scotch and Irish whiskeys in bond varies from 6s., or $1 44c., to 10s. 6d., or $2 52c., per gallon. The duty is 14s., or $3 36c., per gallon, thus making the wholesale price from £1, or $4 80c., to £1 4s. 6d., or $5 88c., per gallon.

*American Whiskeys.*—There are no American whiskeys imported into New Zealand, with the exception of very small quantities for private use. These liquors have never been introduced here in sufficient quantities to be fairly judged. I have been informed by some of the leading liquor-dealers of San Francisco that at first they experienced the utmost difficulty in introducing American whiskeys into British Columbia, but after they were once fairly introduced the people preferred them, and now the demand and sale in that colony are constantly increasing.

*Brandies.*—The brandies in use here are from Charente and St. Nazaire. The price in bond of the above brandies is from 10s., or $2 40c., to 13s., or $3 12c., per gallon. The duty is 14s., or $3 36c., per gallon.

*Rums.*—The brands of Jamaica rums in use are Lowndes, and Lemon, Hart, and Co. The price of rum in bond varies from 4s. 3d., or $1 2c., to 7s. 6d., or $1 80c., per gallon. The duty is 14s., or $3 36c., per gallon.

*Holland Gin.*—The price in bond is from 5s., or $1 20c., to 6s., or $1 44c., per gallon. The duty is 14s., or $3 36c., per gallon.

*Schnapps.*—Udolpho Wolfe's aromatic Schiedam schnapps is very generally used here. The price is from £1 2s. 6d., or $5 40c., to £1 4s., or $5 76c., per case of one dozen quart bottles.

*The Wine Trade.*—The imports of wine into New Zealand for the year 1882 amounted to 179,048 gallons, and the duty collected on the same was £43,780, or $210,144. The duty on European wines is 5s., or $1 20c., per gallon.

*New Zealand Wines.*—There is little wine made in New Zealand at present. Only the North Island is adapted for the growth of the grape, and its culture has not become a settled industry. The grape in the South Island to reach perfection has to be grown under glass except in certain favoured places.

*Australian Wines.*—A strong effort has been made to introduce the Australian wines into this market, but it has met with indifferent success, There does not appear to be any great demand for them. They will not compare in quality or flavour with similar wines made in California.

*California Wines.*—The California wines that have been brought to New Zealand have met with approval. A decided preference for the vintages of Lachman and Jacoba, and Gundlach and Co., and especially for their Muscat, Tokay, claret, champagne, and California red and white wines, has been expressed. The vintage for California for this year has been ascertained to be over 10,000,000 gallons.

*Champagnes.*—The wholesale price of champagne in bond is from £2 4s., or $10 56c., to £5, or $24, per case of one dozen bottles. The duty is 6s., or $1 44c., per gallon. I am of opinion that it would require only a slight effort on the part of the San Francisco and New Zealand merchants to establish a successful business here for these wines.

*Bottled Ale and Beer.*—The wholesale price of bottled ale and beer is 13s., or $3 12c., to 13s. 6d., or $3 24c., per dozen quart bottles; the duty is 1s. 6d., or 36c., per gallon.

*American Lager Beer.*—There have been several small shipments of American lager beer received in New Zealand, which have met with encouraging success, but, not being followed up by regular shipments, the liquor-merchants objected to deal with them.

*New Zealand Beer.*—About 5,000,000 gallons of beer and ale are brewed annually in New Zealand. New Zealand beer is, I think, gradually superseding the imported article. The price is much cheaper, and the quality is steadily improving. The increase in the number of gallons of home-made beer in 1882 was 320,029 over that of 1881.

## NEW ZEALAND MANGANESE.

Manganese was discovered in New Zealand in the early settlement of the colony. The first place where it was found was on the Island of Waiheke, in Auckland Harbour, about eighteen miles from the Queen Street Wharf. For many years nothing was done to turn this metal to profit. Several years ago it was found in the Bay of Islands District, a few miles from the Town of Russell, the ancient

Kororareka, the first capital of New Zealand. Afterwards it was found in the Mongonui District, a considerable distance to the northward of Russell. The deposits in the Mongonui District have never yet been worked, but those at Russell and Waiheke have furnished an article of export for several years past.

The deposit first discovered at Russell has been turned to advantage by London capitalists, who purchased the land upon which it was found, and sent a manager to take charge of the property and to develop its resources. Rails for tramways, carriages, &c., have been obtained, a staff of men employed, and all the steps necessary for vigorously prosecuting the mining operations have been taken. The deposits on Waiheke, being on private property, were utilized as soon as an export of the mineral was established. The principle of working employed was the royalty system, which, so far as is known, has proved satisfactory to all parties concerned. Some of these manganese ores have proved very rich, many of them assaying over 80 per cent. of the metal. The export has been steady during the last few years, and is likely to be largely increased in the future. Large deposits of manganese are found on the Island of Kawau, the beautiful residence of Sir George Grey, K.C.B., formerly Governor of New Zealand. Captain Daldy says the mines there have been profitably worked, and that considerable quantities of the ore have been exported.

The mode of working the lodes consists in "winning" the ore and in what is called "hand-picking," this being done by skilled workmen, known as "sorters," the object being to obtain as high a percentage of binoxide as possible. No machinery has as yet been used in New Zealand for dressing the ore, although the addition of some method of manipulating the ores and the "gangue," or mineral matter in which the ore is mixed, will in the future be required to economize that portion of the ore now lying waste.

Manganese belongs to that class of metals of which iron is the best known representative. It is of a white-greyish colour and of remarkable brilliancy. Its texture is granular, and it has neither taste nor smell. It attracts oxygen when exposed to the air, and its colour is changeable, and becomes grey, violet, and black. The metal is so hard as to scratch glass and steel, and is only fused at a white heat. It is used in the manufacture of glass. It frees that article from the tinge of iron and other colours. On account of its use in this way it is sometimes called "glassmakers' soap" (*savon de verriers*). Manganese, however, is principally employed in the production of chlorine for bleaching. Manganese forms six different oxides, viz., protoxide, sesquioxide, the red oxide, the binoxide or peroxide, manganic acid, and permanganic acid. Permanganic acid is obtained by treating a solution of permanganate of baryta with sulphuric acid. The most important of its salts is the permanganate of potash, so extensively used in analytical chemistry, and is the basis of Condy's disinfectant. Manganese is also one of the ingredients of Fowler's hypophosphates. It is believed to be allied in its properties, as a blood salt, to iron. Its use is highly commended by the *American Medical Journal*, when combined with quinine, lime, and potassa, as a nerve and blood tonic.

A new substance, known as manganese bronze, is now being very generally used in the construction of machinery. It consists of manganese and copper, the proportion of copper being 78 per cent. The new propeller of the Pacific mail steamer "Zealandia" is made of manganese bronze. The great strength of this material, and its perfect freedom from corrosion, render it possible to make the blades of the screw very much thinner than those composed of other metals, and, in addition to this, a perfectly smooth surface for the blade is obtained, thus almost entirely doing away with the loss occasioned by friction of the blades upon the water. It is claimed that the new propeller of the "Zealandia" has increased the speed of that vessel fully 1¼ knots per hour.

Although manganese has been exported from New Zealand in considerable quantities for many years, it was not specified in the list of colonial exports until 1878, and during that year 2,516 tons, valued at £10,416, or $49,997, were exported. The manganese that had been previously exported was included under the general head of "Copper and other metals." The following table shows the quantity and value of manganese exported from New Zealand from 1878 to 1882, inclusive:—

| Year. | Quantity in Tons. | Value. | |
|---|---|---|---|
| | | £ | $ |
| 1878 ... ... ... | 2,516 | 10,416 | 49,997 |
| 1879 ... ... ... | 2,140 | 8,338 | 40,022 |
| 1880 ... ... ... | 2,611 | 10,423 | 50,030 |
| 1881 ... ... ... | 1,271 | 3,283 | 15,758 |
| 1882 ... ... ... | 2,181 | 6,963 | 33,422 |

The extent of the trade for this year will probably be limited by the quantity sailing-vessels will take from here to London and New York. The price is so fluctuating in both cities that exporters cannot afford to pay a heavy freight upon it. It is sometimes taken from here as ballast, or at a nominal freight. I have known, however, exporters to pay as high a rate as 16s. 8d., or $4, and £1 0s. 10d., or $5, per ton. The price of manganese in London by the standard, which is fixed at 70 per cent., is about 2s. 7½d., or 62½ cents, per unit, advancing or receding. It however becomes unsaleable when it gets below 70 per cent. A small quantity of manganese, yielding 75 per cent., was sold in Auckland recently for £3 2s. 6d., or $15, per ton. It is generally shipped in bulk, but I have sometimes seen it put in strong canvas bags.

Rich mines of manganese are worked in Germany, Spain, Norway, Russia, and in various parts of the United States. Great Britain, however, receives her principal supply from Russia, where some of the most valuable mines in the world have been discovered, much of the ore yielding over 90 per cent. of the oxide.

## WOOL.

Wool is by far the most important product of New Zealand. Its export in 1882 exceeded in value that of gold by £2,196,890, or $10,545,072. The growth of the wool industry of this colony has been extraordinary within the last few years. I find, in tracing its history, that in the year 1851 there were only 233,000 sheep in the colony. In 1858 there were 1,523,316. In 1861 the number was 2,760,183. The number on the 31st May, 1883, the date on which by law each owner has to return the number of sheep owned by him, was 13,288,152, being an increase of 880,046 over the number returned for 1882, and the wool clip is valued at £3,179,662, or $15,262,377.

At one time nearly all the wool used in Great Britain and the United States came from Spain, Saxony, and Odessa, but now the principal supply is produced in the Australasian Colonies. Of the seven Australasian wool-producing colonies, New South Wales ranks first, New Zealand is the second on the list, Victoria coming in third. Out of about 300,000,000 lb. of wool annually produced in Australasia, New Zealand furnishes more than one-fifth of that quantity, but notwithstanding the magnitude of this trade it must be regarded—at least so far as New Zealand is concerned—as only in its infancy. Every year new lands are being occupied and put in condition for sheep-raising.

The range of climate, passing through 13° of latitude, from temperate to semi-tropical regions, enables the New Zealand farmer to utilize almost every fodder-plant known to exist. No expense is spared to improve the condition of the soil and grasses. Some idea of the wealth and enterprise of the New Zealand farmers can be formed from the recent returns issued by the Government that there are in the colony 133 sheepowners each owning over 20,000 sheep, and that several own over 250,000 sheep each. So much pains is taken to improve the condition of the sheep that this colony has produced superior varieties. This fact is so well known that New South Wales, Victoria, and Tasmania sheepowners frequently import New Zealand rams and ewes to improve their own breeds, the New Zealand sheep being especially adapted for combing purposes.

The original stock of sheep in this colony was nearly all drawn from Australia. Occasionally a few stud sheep are imported from England, France, Spain, and America; sheepowners, however, continue to procure their high-class sheep from the other Australian Colonies.

Mr. Studholme has, on his magnificent estate at Waimate, situated about half-way between Dunedin and Christchurch, over 2,000 stud merino ewes. Some of these came from the estate of Mr. Kermode, the famous sheep-king of Tasmania, and others from the magnificent run of Mr. Rich, of Bushby Park, in Otago, New Zealand. Besides the merino stud flock at Waimate, there are 10,000 merino ewes, 8,000 of which went to merino rams, and the remainder to Lincoln-Leicesters. In addition to these is a dry flock of 13,000 merinoes, besides 27,000 cross-breds on various parts of the property. This splendid sheep-run does not, however, constitute the valuable part of Mr. Studholme's property. He has on his place, which consists of 120,000 acres, 2,400 shorthorn cattle and 540 blood horses. Fifty thousand acres of his land run from the hills to the sea. It is all good strong wheat land, and it is said that 15,000 acres of it is not surpassed for fertility in the world. One field of 3,500 acres averaged over 45 bushels of wheat to the acre; of 1,200 acres put in oats and 400 in barley, the average yield of the former was from 50 to 107 bushels to the acre, and the latter from 40 to 82 bushels. Mr. Studholme charters his own ships, and recently sent the "Glenavon" to England with 1,500 tons of wheat and 150 tons of flour.

I visited a number of sheep-runs in Otago, including those of the Hon. Mathew Holmes, member of the Legislative Council, at Castlerock, and of the New Zealand Agricultural Company on the Waimea Plains. The number of sheep on the large stations varies from 15,000 to 200,000. Each owner fences his run in order to reduce the expense of shepherding. The fence is generally composed of split posts carrying five or six wires. When timber is scarce rough iron standards are substituted for wooden posts. Nearly all the large sheep-runs are leased from the Government. The owners pay rent for them at the rate of 7d. per head for the sheep.

In shearing time the manager is constantly overlooking the shearers for the purpose of seeing that the work is well done, that the clipping is uniform and without second cuts or steps. When the fleece is taken off it is carried to the sorting-table, where it goes through the process of skirting, which consists of taking off the locks, bellies, top-knots, and shank-pieces, and in removing any stained wool. The fleece is then rolled up and assorted. It is then ready for the woolpack. The woolpacks are pressed into bales weighing about 400 lb. each. The woolpacks chiefly in use are those manufactured in Calcutta, being made of jute, and very strong, each weighing about 10 lb. The cost of these is from 3s. 1½d., or 75 cents, to 3s. 5½d., or 82½ cents, each. The shearers are paid from 15s., or \$3 60c., to £1, or \$4 80c., per every hundred sheep shorn.

The merinos, especially in the South Island, prosper far better than any other kind of sheep. The New Zealand merinos include every variety, producing from small-growth clothing to broad deep clothing wool. The wool is clean and free from burs. Some owners delight in raising sheep for the finest varieties of wool; but the greater majority prefer a fair or medium quality, looking more for the return per head than per pound. There is, of course, a greater demand for intermediate wool than for fine wool, and owners naturally give their attention to that branch of the industry which is most profitable.

At an annual sale of stud sheep, held at the wool warehouse of the New Zealand Loan and Mercantile Agency, Collins Street, Melbourne, in 1882, a pure-bred ram was sold to Mr. Denbigh Hall for 295 guineas; another was sold to Mr. James Winter, Dhuringile, for 185 guineas. These prices do not by any means represent the maximum paid for pure-bred stock, for it is well known that as much as 800 guineas has been paid for a single ram in this colony.

The following table gives the quantity and value of wool exported from the Colony of New Zealand for each year from 1870 to 1882, inclusive:—

| Year. | Quantity. | Value. | | Year. | Quantity. | Value. | |
|---|---|---|---|---|---|---|---|
| | lb. | £ | $ | | lb. | £ | $ |
| 1870 | 37,039,763 | 1,703,944 | 8,178,931 | 1877 | 64,481,324 | 3,658,938 | 17,562,902 |
| 1871 | 37,793,734 | 1,606,144 | 7,709,491 | 1878 | 59,270,256 | 3,292,807 | 15,805,473 |
| 1872 | 41,886,997 | 2,537,919 | 12,182,011 | 1879 | 62,220,810 | 3,126,439 | 15,006,907 |
| 1873 | 41,535,185 | 2,702,471 | 12,971,861 | 1880 | 66,860,150 | 3,169,300 | 15,212,640 |
| 1874 | 46,848,735 | 2,834,695 | 13,606,536 | 1881 | 59,415,940 | 2,909,760 | 13,966,848 |
| 1875 | 54,401,540 | 3,398,155 | 16,311,144 | 1882 | 65,322,707 | 3,118,554 | 14,969,059 |
| 1876 | 59,853,454 | 3,395,816 | 16,299,917 | | | | |

The wool of New South Wales is regarded for fineness as second only to the best of Saxony. Very little Saxony wool, however, now finds its way to the American market. Indeed, many think that the New South Wales wool is fully equal to the best of Saxony for the manufacture of cloth. The Saxony may possess a little more gloss, but the New South Wales is much softer when finished, and takes more distinct and delicately-shaded colours in dyeing. The New South Wales wool, however, is far inferior to New Zealand wool for combing purposes. New Zealand wool is, in fact, a fine long-staple wool, very soft and silky, and of bright lustre. It surpasses all other Australasian wool for receiving bright and fast colours. The American, French, German, and English manufacturers import it in large quantities to blend with and improve the harsh wools of other countries. German and American wools, when used alone, make an indifferent-looking cloth, harsh to the touch, and of short nap.

The wools of New Zealand embrace a wide range of variety, condition, and staple, and are admirably adapted to the manufacture of all kinds of woollen goods. Indeed, there are few kinds of sheep that do not prosper here: Merinos, Lincolns, Leicesters, Romney Marsh, Cotswolds, Southdowns, cross-breeds, and quarter-breeds—all do well.

Much New Zealand wool is sold in the United States under the name of fine Berlin wool. It is a great favourite with the ladies, who, of course, are not aware that it never saw Germany. Much of the Victorian wool is also sold as fine Berlin wool, and gives great satisfaction. The same thing can be said of the Tasmanian wool, which, although not quite equal to the New Zealand and Victorian, is, nevertheless, a first-rate article for combing and clothing purposes, and makes excellent flannel.

The South Australian, or Adelaide wool as it was formerly called, is altogether of a different variety from those above mentioned. In quality it is not so good, but it is very useful for working into certain grades of cloth. It is altogether unsuitable for the manufacture of blankets, being too fine, and possessing in too high a degree properties of felting.

After a long and close study of the wool industry of these colonies, a study in which I have been aided by the practical experience of some of the most prominent sheepowners and woolstaplers in Australasia, I have come to the conclusion that the New Zealand wool is better adapted to the various articles of American manufacture than that raised in any other country. Besides its great length of staple and superior combing properties, it is especially adapted for goods requiring lustre. Its use for medium cloths and tweeds gives very general satisfaction. It resembles English wool more than any other, and is often of a much better quality. It works up well, and is of a fine, soft, silky texture. It does not mill so fast as the other Australasian wools. It is deeply grown, and very full and close in the staple. When properly assorted it furnishes many varieties. It is very white and clear, and is suitable for any coloured dye. It does not, when worn, shrink up like some kinds of wool. Its employment in the manufacture of American blankets and flannels is becoming more and more popular.

No other of the Australasian Colonies seems to be so well favoured for the production of wool as New Zealand. The climate is so mild that the sheep can run out all the year round without housing or artificial feeding. The country is abundantly watered. It is not subject to the severe winters of Canada, or the fierce heat and long droughts of Australia.

In the finer qualities of wool the filaments vary in thickness from $\frac{1}{1100}$ to $\frac{1}{1500}$ parts of an inch, and under a microscope distinctly exhibit at intervals of about one three-hundredths of an inch a series of serrated rings, imbricated towards each other like the scaly zones of a serpent's skin.

When wool grown in countries where there is a varying temperature is examined under a glass, one portion of the fibre will appear thinner than another portion. This is generally due to the different degrees of heat and cold under which it is grown. In New Zealand this peculiarity is wholly absent, the fibre being even and fully developed throughout its length—a circumstance no doubt due largely, if not wholly, to the even and steady temperature of this fertile colony.

Wool contains 98 per cent. of organic element and 2 per cent. of ash. The former consists of carbon, 50·65; hydrogen, 7·03; nitrogen, 17·71; oxygen and sulphur, 24·61: equal to 100. The ash contains oxide of iron, sulphate of lime, and phosphates of lime and magnesia, so that sulphur is a very important element in the composition of wool. It has been shown, according to a recent calculation, that the sheep in Great Britain extract from the soil annually over 5,000,000 lb. of sulphur.

The time for shearing varies according to locality. In some parts of the North Island it begins as early as the month of September, but in the South Island, where the climate is more rigorous, New Zealand being south of the equator, operations are not begun until January, and frequently March is approached before shearing is finished.

There is a great difference in the shrinkage of New Zealand wools, running from 45 to 60 per cent. for clean wool, occasioned by the nature of the country on which the sheep run. For instance, in the southern part of Otago, where the rainfall is heavy and the soil of a cold clay, the shrinkage of wool is very small; but change the same sheep 150 miles north, where the rainfall is light and the land of limestone formation, the shrinkage is great, and the wool exhibits a yellow yolk.

The majority of merino sheep are bred on large stations and fed on native grasses, much of the country being too rough and mountainous for cultivation. In the summer months the sheep feed on the higher elevations, but when winter approaches they are driven to the lower country to avoid the rain and the snow on the tops of the mountains.

Mr. Osborne, an old wool-buyer, of Auckland, to whom I recently addressed some interrogatories on the subject of wool, says, in reply: "I am an old woolstapler of at least forty years' experience, and have a good knowledge of what the different kinds of wool are suitable for; and I do not hesitate to say that the New Zealand wool is by all means the best suited for articles of American manufacture, and for mixing with and improving American, German, and English wools. I may state that I was in the habit for many years of selling large quantities of wool to American houses through my London brokers, and therefore can speak advisedly on the subject."

I have forwarded to the Department of State samples of Canterbury (New Zealand) wools. These samples were obtained for me by Mr. John Cooke, manager of the New Zealand Loan and Mercantile Agency at Christchurch, New Zealand. Mr. Cooke, in a letter addressed to me accompanying the samples, dated the 12th January, 1882, says: "The samples fairly represent the character of staple produced in this place, though the condition may vary from season to season. It will be observed that while the wools carry heavy yolk and grease they are quite free from burs, and perfectly sound. The price affixed to each sample is its present value in this market; of course this varies from time to time in sympathy with the fluctuation of the wool market. The quotations now current are slightly above the average of the past few years, and, as evidence that growers are satisfied with them, a larger quantity of wool has changed hands this year than in any former season."

The samples represent the wools in their natural state, in the grease, just as they were clipped from the sheep, without any washing or artificial dressing whatever. They are seventy-seven in number.

I would especially direct attention to the eighteen samples of pure-bred merino. These are considerably longer in staple than the wool of the best pure-bred stock grown in the most favoured districts of New South Wales or any of the other Australian Colonies, and are equally fine, soft, and silky. They present, I think, a distinct type of wool peculiar to New Zealand. The prices range from 19 to 26 cents per pound, this being their market value in Christchurch. There are twenty-one samples of merino crosses of different degrees, and their prices range from 16 to 21 cents per pound. There are also twenty samples of Leicester wools, running from the ordinary Leicester to the English and border Leicester. These, like the others, are unwashed, and range in price from 13½ to 21 cents per pound. Of the Romney Marsh there are eight samples, 16 and 18 cents per pound being the current prices. Of Lincoln wools there are ten samples, ranging in price from 12½ to 15½ cents per pound. The weight of the fleece from which the samples were obtained ranges from 14 lb. to 24 lb. per fleece of twelve months' growth.

Canterbury, the district in which the samples of wool were grown, is at present the richest and most interesting part of the colony. It comprises an area of 8,693,000 acres, of which 2,500,000 acres form a vast plain, sloping gradually from the mountain range called the Southern Alps to the sea.

The population of Canterbury, as shown in the last census, was 112,182. In 1871 its population was only 46,801. The number of sheep in this district is 3,448,145. These are distributed among 1,680 owners. Some of these owners have as many as 20,000 sheep on a single run. The runs vary in size from 5,000 to 100,000 acres, and are well grassed and watered.

The wools grown in the District of Canterbury, and in those parts of Nelson and Marlborough which find their way to the port of Lyttelton, in Canterbury, for shipment, comprise merino wools of the finest clothing, and longwools of the purest English types of Lincoln, Leicester, Cotswold, and various grades of crosses between the merino and longwools. The Canterbury merino is said to present the highest type of this kind of wool grown in New Zealand. The fleece is of extraordinary size. It separates freely like a skein of silk, and manufacturers find that there is very little waste about it when passing through the combing process. I have examined some specimens that have received as bright and distinct colours as can be given to the finest qualities of silk. In some respects it is superior to Saxony wool, which is often described as the best in the world. For instance, it is richer in yolk than Saxony; and this is saying a good deal, for Saxony wool often yields fully 85 per cent. of yolk; but it must be remembered that this large yield of yolk is brought about by the process of sweating the sheep before shearing; whereas the Canterbury wool yields nearly as great a percentage of yolk or fatty matter as that of Saxony without passing through the artificial means of sweating, which is not needed in Canterbury on account of advantages of climate and the excellent condition of the feed. The average yield of yolk in the Canterbury wool can be safely set down at 65 per cent. Lincoln and Leicester wools do not yield more than 20 per cent. Yolk has been described as a soapy matter consisting of animal oil in combination with potash and carbonate of potash. It appears to be produced in small glands for the special nourishment of the wool. The finest unwashed wool measured, under the micrometer, $\frac{1}{1227}$ inch, and washed, $\frac{1}{1405}$ inch.

The best flocks are not confined to any particular locality. It is believed, however, that the soil of the Amuri, North Canterbury District, where the hills are partly of limestone formation, produces the class of wool that American buyers prefer.

Canterbury wool is shipped direct to London from Lyttelton Harbour, and generally in the grease, the locks and pieces being scoured before shipment. Very few flocks are washed before they are shorn.

The whole of the wool product of these Islands, with the exception of about 2,000,000 lb. for local consumption and a few small shipments to the United States, goes direct to London. The cost of freight to London is from ⅝d. to 1d. per pound. About one-tenth of this wool is forwarded to the manufacturing districts direct, and the remaining nine-tenths is sent to the warehouses for sale by auction.

The wool which finds its outlet at Auckland to San Francisco is grown principally in the District of Hawke's Bay or Napier, which is a fertile and interesting part of the colony. It lies between Auckland and Wellington, with the former on the north and the latter on the south. Its western boundary is formed by the Ruahine Range of mountains. The district comprises an area of about 3,000,000 acres, the greater part of which is so fertile that crops of every kind can be grown without the aid of artificial manure. In the centre of the district are the famous Ahuriri Plains, which have often been compared to the rich alluvial lands forming the basin of the Trent. The Ahuriri Plains are watered by three large rivers, which take their rise in the mountains and empty into Hawke's Bay, from which the district is named. These rivers also receive the drainage of the plains. It is said that at any point on these plains an unfailing reservoir of pure water can be obtained by the expenditure of a very small sum. An artesian pipe is driven from 50 to 100 feet, and pure water gushes forth in abundance. This fact renders the land very desirable to small farmers who reside at a distance from the rivers, thus enabling them to water their stock and irrigate their land fully as well as if they lived on the banks of running streams. The country is so fertile that even the land which is set apart for sheep-runs is so rich that it is capable of maintaining from five to seven large, longwoolled sheep per acre all the year round. In one part of the district the forest is so extensive that it is known by the name of the Seventy-Mile Bush. In this forest there are extensive clearings. The number of sheep in Napier or Hawke's Bay District is 2,600,000.

Of the wools shipped from the South Island about ten million pounds have the English or long-wool strain, either as half-bred, three-quarters, seven-eighths to fifteen-sixteenths, or pure-bred: that is, merino ewes are crossed with the Leicester, Lincoln, Lincoln-Leicester, or Romney Marsh, thus producing the first cross or half-bred. Their progeny is again sent to the pure Lincoln ram and three-fourths strain is produced, and so on until the result is nearly pure long-wool. Thirty-eight million pounds are fleeces from the merino flocks which predominate throughout the South Island. All these grades are fairly represented by the samples before mentioned. Of the twenty-eight million pounds shipped from the North Island a larger proportion is of the long-wool type, the country and grasses of the North Island being better adapted to this class of sheep.

In the North Island merino sheep do not prosper so well as in the South Island. New Zealand being south of the equator, the climate is of course colder in the south than in the north. The sheep-runs in the South Island are generally situated on the slopes of the great range of mountains that runs throughout its entire length. In the

North Island the high lands are in isolated volcanic peaks, extinct or active, and not in a continuous chain of mountains as in the South. Hence the marked difference in the breeds of sheep in the two Islands. Merino sheep when placed on the more level land in the North Island, with the warm climate, more moisture, and greater force of vegetation, invariably suffer from a disease called foot-rot. The heavier class of sheep, such as the longwoolled Lincolns and Leicesters, thrive very well in North New Zealand; various crosses of these two kinds are to be found there. As much as from 19 lb. to 24 lb. of wool is often sheared from a single sheep of this breed.

There is much to be said in favour of the climate of the North Island for the growth of wool. Neither the heat nor cold is ever excessive, and the very small variation of temperature in this Island between the day and night secures evenness and length of staple.

In the North sheep-farming nearly always forms part of a system of mixed husbandry, except in a few cases where Europeans have succeeded in obtaining blocks of land from the Maori owners. In a natural condition the land in the North Island is generally covered with forests, dense scrub, or the common field fern, interspersed with various kinds of brushes, all of which require outlay of money in order to bring the land into a condition for sheep-farming. This naturally prevents the land in the North from being used in such large blocks as in the South.

Cross-bred wool ranks next to merino as regards the quantity produced. As a rule this kind of wool is fairly grown; but it lacks uniform character. Some fleeces are almost as closely grown as those of the merino; but others are loose and uneven, and it is difficult to combine them. No success has attended the many efforts to perpetuate this stock. Either the sire or the dam must be of pure blood in order to produce a fair quality of wool. This class of sheep is very popular when the farmer can use them for mutton. They come to maturity much quicker, and their bodies are much heavier than the merinoes.

The most successful crossing of the long-wool and merino that has been made in the South Island is when the Lincoln ram is put to the merino ewe, and the progeny again put to the Lincoln ram, and the ewes from this cross coupled with the merino ram.

In former years American wool-buyers appeared in the Canterbury market, and purchased several clips of fine merino at rates about equal to those now current there. The bulk of their purchases was shipped direct to Boston, but within the last few years there has not been a single direct shipment of wool from Canterbury to the United States. There were, however, during the year 1882 a few small shipments of wool from Auckland *viâ* the Pacific Mail Steamship Company to San Francisco, and from thence by railway to New York. The total value of these shipments amounted to £901, or $4,325.

The cost of freight on wool from Auckland, New Zealand, and Sydney, Australia, to San Francisco and New York, *viâ* the Pacific Mail Steamship Company, is as follows: Wool compressed, in any quantity, to San Francisco, 1 cent per pound; to New York and Boston *viâ* San Francisco and railroads, 2 cents per pound; to New

York *viâ* San Francisco and Panama, all steamer, 1½ cents per pound; to Boston *viâ* San Francisco and Panama, all steamer, 1⅝ cents per pound.

The cost of sending wool to the London market is about 4 cents per pound on ordinary greasy wool. This sum includes freight, insurance, interest, exchange, and commission.

While it is true that the wool industry of the United States has increased rapidly during the last few years, the annual clip now amounting to about 300,000,000 lb., yet there has been at the same time a corresponding increase in the imports of wool, which amount to some 200,000,000 lb. As soon as the qualities of wool peculiar to New Zealand become better known in the United States, American manufacturers will import these wools direct, instead of obtaining them *viâ* London and other European markets. This method of purchase will, of course, be of manifest advantage to both countries, for when the people of New Zealand find a ready market for their wool in the United States they will be more likely to patronize American manufacturers than at present. The people here want to exchange their raw products for articles from American workshops, but are obliged to purchase from European markets, because it is to be expected that they will buy such manufactured articles as they need from those countries in which they find a ready market for their own raw products.

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## WOOLLEN MANUFACTURES.

The value of the various kinds of woollen goods, including blankets, imported into New Zealand during the year 1882 was £155,314, or $745,507. The duty charged on them is 15 per cent. ad valorem. It has been the opinion of the leading public men of New Zealand for many years past that certain grades of woollen goods can be manufactured in the colony much cheaper than they can be imported from Europe and America. The average annual value of the raw-wool product of the colony is between £3,125,000, or $15,000,000, and £3,750,000, or $18,000,000, and there is every reason to believe that the value of the product will be still further increased. This fact, together with the almost boundless supply of cheap coal for steaming purposes, has led people to consider the propriety of sending their wool abroad to be manufactured, and thus incur the extra charges in the way of freight, insurance, duty, and the intermediate profits of the manufacturers and commission merchants, when the raw product can be manufactured at home. The truth is, the industry of sheep-farming in New Zealand is becoming every year more and more profitable.

The three woollen mills established in the South Island have been successful to a degree far beyond the expectations of their founders. Already over 2,000,000 lb. of wool are consumed annually by them. One of these mills is the Mosgiel Woollen Works, situated about ten miles from the City of Dunedin; another is the Roslyn Mills; and the other is at Kaiapoi, fourteen miles from Christchurch.

Much of the machinery used in the Mosgiel works was manufactured in the United States, the most remarkable of which is a machine for clipping the nap of the cloth. It is no longer a disputed fact that it was an American who first invented what is known as the helicoidal shears, a cutting machine with spiral blades on a cylinder acting against a straight steel blade and shearing the nap of the cloth perfectly even. The automatic Bigelow carpet-loom, Simpson's wool-comber, and the compounder, which makes from comparatively thin yarns the heavy pile goods known as the Windsor fabrics, are all American inventions. The blankets and other goods made at the Mosgiel Woollen Works are absolutely unsurpassed in quality and finish. They carried off the first prizes at the International Exhibition at Sydney. The blankets are heavier than those imported from England, and are pure wool, not mixed with cotton or any other material. These blankets find a ready sale at about 3s. 7¾d., or 87½ cents, per pound weight. The blankets imported from England sell from 1s. 7d., or 38 cents, to 2s. 7¼d., or 62½ cents, per pound. Some of the English blankets are largely made of shoddy. Many are under the impression that the manufacture of shoddy blankets is something new in the manufacture of woollen fabrics, but such is not the case. As far back as the time of Hugh Latimer this fraud was practised. Indeed, that sturdy old divine denounced from his pulpit "the mixing of wares, the stretching of woven pieces to more than their proper length, and the practice of restoring body in cloth by incorporating into it a so-called flock powder." A project for reforming these abuses was sent to Cecil. In 1590 the people of York appointed a committee "to deface, cut into pieces, or burn all such blocks or boards as are used for chopping of flocks."

It is a curious fact that little progress has been made in the art of weaving. Of course the introduction of machinery has done much to quicken and facilitate the process, but it may well be questioned whether any actual improvement has been made in the fabrics themselves. It is well known that the natives of India, as far back as the time of the Macedonian conquest, made shawls of unsurpassed beauty, and that both the Greeks and Egyptians were versed in many branches of woollen manufacture. The flax mats and other garments woven by the Maoris are far more beautiful and durable than anything of the kind that has ever been produced by the most improved machinery in modern times.

The Mosgiel Woollen Company has recently enlarged and rebuilt its works at a very heavy cost. The carding- and spinning-room is 200 feet in length and 120 feet in width; the walls are built of hollow brick 14 inches in thickness, and the floor, which is 8 inches thick, is made of concrete. The beams that support the roof are of the best Oregon timber, some of them being 81 feet in length. There are many other improvements in the course of construction, and the entire building is so arranged that the factory can be still further enlarged upon the same principle. The demand for the cloth of the Mosgiel Mills is so great that the company cannot comply with the demand, although the electric light has been introduced and the machinery is kept going both day and night. The uniforms of the police and the armed forces of the colony are made of cloth manufactured in the colony.

About £72,916, or $350,000, have been expended on the Roslyn

Woollen Mills. The site of the factory was purchased in June, 1878, and the machinery arrived in Dunedin in 1879. The building was ready for it, and it was at once put in order. The building is 216 feet in length and 148 feet in width. The machinery is driven by a fine horizontal tandem engine of 60-horse-power. Two boilers, one of Galloway iron and the other of Siemens-Martin steel, supply steam to the engine, and also, through pipes, to different parts of the factory for boiling water and other purposes. Over the boilers is a room for drying yarn, thus utilizing the heat which would otherwise be wasted. The new patent rope-belting is used, the advantage of which is that should two or even three strands give way the works are not brought to a standstill. The building is lighted by the electric light, showing that the people of this distant land know how to keep pace with the times.

I have been unable to procure a balance-sheet showing the assets and liabilities of the Roslyn Woollen Company, or of the celebrated Kaiapoi Woollen Works, near Christchurch; but both of these factories are based upon the most solid business principles, and pay handsome dividends to the stockholders. I give below a table showing the value of all the various kinds of woollen goods, exclusive of carpetings, imported into New Zealand for each year from 1871 to 1882, inclusive:—

| Year. | Value. | | Year. | Value. | |
|---|---|---|---|---|---|
| | £ | $ | | £ | $ |
| 1871 ... | 85,247 | 409,185 | 1877 ... | 107,594 | 516,451 |
| 1872 ... | 123,283 | 591,758 | 1878 ... | 137,207 | 658,593 |
| 1873 ... | 146,228 | 701,894 | 1879 ... | 139,535 | 669,768 |
| 1874 ... | 184,418 | 885,206 | 1880 ... | 105,103 | 504,494 |
| 1875 ... | 216,088 | 1,037,222 | 1881 ... | 97,245 | 466,776 |
| 1876 ... | 137,765 | 661,272 | 1882 ... | 155,314 | 745,507 |

The Customs returns do not classify the various kinds of woollen goods imported into the colony, but tweeds and coatings and blankets form the most valuable part of the imports. About £25,000, or $120,000, worth of blankets are imported annually. Scotch tweeds sell in New Zealand from 3s. 1½d., or 75 cents, to 5s. 2½d, or $1 25c., per yard. The prices of coatings, cloths, and flannels vary greatly, and are fluctuating. There is a steady demand throughout the colony for Scotch, Yorkshire, and West of England tweeds. Crossley's carpets (tapestry), best quality, sell readily for 3s. 7½d., or 87½ cents, per yard, and good Brussels bring from 4s. 2d., or $1, to 5s. 2½d., or $1 25c., per yard. Axminster carpeting varies from 4s. 2d., or $1, to 8s. 4d., or $2, per yard, according to quality. Crimean coloured shirts, of which large quantities are brought to New Zealand, sell from £1 11s. 3d., or $7 50c., to £4 11s. 8d., or $22, per dozen. Woollen undershirts, woven Leicester, sell from £2 1s. 8d., or $10, to £3 6s. 8d., or $16, per dozen, and woollen drawers bring about the same prices. All the various styles of woollen goods used in Great Britain and the United States find ready sale in this colony.

## NEW ZEALAND CATTLE.

The steady annual increase in the exports of New Zealand dairy produce and frozen meat, together with the favourable condition of the country, it being well grassed and watered, have done much toward improving the cattle in this colony. Moreover new lands are being fenced in every year and sown with English grasses. Both the volcanic and light sandy soils of the colony produce rich succulent grasses, well adapted for fattening cattle without extra food.

The number of cattle in New Zealand on the 31st December, 1883, may be given at about 1,000,000. The census for cattle was formerly taken in New Zealand every three years, but in future it will be taken every fifth year; consequently until April, 1886, the number can only be given approximately. The subjoined table shows the number of cattle in New Zealand at each census since 1858:—

| Year. | Number. | Year. | Number. |
|---|---|---|---|
| 1858 | 137,204 | 1871 | 436,592 |
| 1861 | 193,285 | 1874 | 494,113 |
| 1864 | 249,760 | 1878 | 578,430 |
| 1867 | 312,835 | 1881 | 698,637 |

In 1881 Auckland District had 158,181 head of cattle; Taranaki, 51,846; Wellington, 140,951; Hawke's Bay, 36,213; Marlborough, 9,919; Nelson, 31,620; Westland, 7,944; Canterbury, 111,155; Otago and Southland, 150,150; and the Chatham Islands, 658. About 40 per cent. of these cattle consist of shorthorns, and the remainder of Jerseys, Devons, Ayrshires, Normans, and mixed breeds.

While New Zealand has produced a higher class of cattle than other Australasian colonies, she is only the fourth in the list as regards numbers. Taking the census of 1881 as a guide, Queensland had 4,059,715; New South Wales, 1,859,985; Victoria, 1,287,088; New Zealand, 698,637; South Australia, 306,046; Tasmania, 122,504; Western Australia, 65,473: total Australasia, 8,429,448.

All the Australasian colonies except New Zealand have had for many years prohibitory laws against the importation of cattle. New Zealand, on the contrary, admitted cattle not only from Australia, but from Europe and America. I regret, however, to state that from 1st January, 1884, the Government of this colony, mainly at the request of the Australian Colonies, issued regulations by an Order in Council under "The Diseased Cattle Act, 1881," prohibiting the importation of live stock from Europe and America, and from all parts except the Australian Colonies. Mr. Robert J. Creighton, the Agent of the New Zealand Government at San Francisco, has repeatedly pointed out that there is no cattle disease such as rinderpest or foot-and-mouth disease on the Pacific Coast. He has also shown that the Texas fever which cattle-breeders fear so much has for many years been localized. The old plan of driving cattle long distances, which was the principal cause of the outbreak of this disease, has been abandoned on account of the improved facilities for transporting live stock by railway in Texas, New Mexico, and Colorado. The liability to the outbreak of this disease is now reduced to a minimum. Moreover, none of these cattle have access to the blooded herds or dairy stock of the country.

The question of quarantine is one on which the authorities on cattle diseases differ widely. The quarantine regulations in nearly all countries are so loosely enforced as to be practically worthless, and occasion a vast amount of trouble and expense. Besides, many diseases of animals, like those of human beings, are localized. For instance, certain diseases in tropical countries are unknown in cold climates; tropical countries are wholly free from many diseases of frigid zones, and any attempt to regulate them by quarantine would be useless. When a country happens to be free from a certain disease, even if it should be a disease that cannot be imported, many are inclined to attribute its absence to the existing quarantine regulations. Now, it is well known that there has never been a single case of hydrophobia* in any one of the Australasian Colonies, yet thousands of dogs have been imported from countries where this awful disease is prevalent. Dogs have lately, however, been prohibited from being imported into this and several other of the Australasian colonies.

The law forbidding the importation of cattle will enhance temporarily the price of cattle, but in the end will prove injurious to the cattle industry. Should there be no further importation of thoroughbred cattle into New Zealand, the cattle will not only cease to improve, but will deteriorate. The prohibition does not apply to Australia, yet the only cattle disease ever found in the colony was brought from Australia. Some time ago the United States Government appointed a committee to inquire into the dangers which would arise to that country from the introduction of neat cattle from Europe for the improvement of native breeds, and the committee reported that the introduction of neat cattle did not tend to the spread of contagious or infectious diseases. The operation of the United States law prohibiting the introduction of neat cattle was therefore suspended upon the condition that the importers and owners should submit to such regulations as the Government should from time to time prescribe. In 1883 a resolution was adopted in the British House of Commons prohibiting the importation of cattle from any country in which the foot-and-mouth disease prevailed, and charges were made in Parliament that cattle so infected were shipped from the United States ports. Now, the only foundation for the report was the fact that cattle suffering from this disease had been imported into the United States from Great Britain.

The United States Treasury Cattle Commission reported from Boston, Mass., in July, 1883, as follows: "Beginning with the great rendezvous of cattle at Kansas City, Council Bluffs, and Omaha, we have made careful investigations along the lines of cattle traffic as far as the eastern seaboard. In this investigation we have included all the great stockyards where cattle are detained for feeding, watering, sale, &c.; all the great feeding stables connected with distilleries, and starch, glucose, and other factories; all the city dairies where stockyards exist, and where the herds are replenished from such stockyards; and to a large extent the great dairying districts, into which cows are drawn from the above-named stockyards and lines of travel. Up to the present date we have made observations in the stockyards at the seaboard, the terminal end of our cattle traffic, and that to which all infection must gravitate; but, apart from the imported cases from Great Britain, we have been unable to find a single case of the foot-and-mouth disease complained of."

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* Rabies or hydrophobia has occurred more than once in New South Wales.

It is but natural that the high class of cattle produced in New Zealand should attract the attention of cattle-breeders in distant countries. In August, 1883, Mr. A. W. Sisson, of California, despatched Mr. Rollin P. Saxe, a cattle expert, to New Zealand, to purchase for him a herd of pure-blooded Herefords. After visiting the cattle districts in the colony, Mr. Saxe purchased twenty two-year-old heifers in calf, and twenty-four bulls from one to two years old, from the New Zealand Stock and Pedigree Company, Auckland. Mr. Saxe was not only surprised at the superb condition of the cattle, but at the low prices at which they were sold. They were shipped to San Francisco, by the Pacific mail steamer " Zealandia," in October, 1883, being the first shipment of New-Zealand-bred cattle ever made to the United States. Mr. Saxe is of the opinion that Hereford cattle can be more easily and economically brought to California from New Zealand than across the continent by railway from Illinois and other States celebrated for this particular breed In Illinois these cattle sell at from £104, or $500, to £1,041, or $5,000, per head, whereas they can be bought in New Zealand at from £42, or $200, to £146, or $700, per head. Arrangements, it is said, have been made for monthly shipments of Herefords from Auckland to California; and Mr. Craig, of San Francisco, has proposed to establish a farm for them on the Contra Costa Slope, near Oakland, California.

It is noteworthy that the two breeds of cattle most largely in demand in the United States, viz., Jersey and Hereford, thrive better in New Zealand than other kinds of cattle, and sell at remarkably low prices. The Jerseys are not so numerous as the Herefords, from the fact that they were introduced at a much later period, but it is known that they do equally well. My attention has recently been called by stock-farmers to the high prices which these breeds bring in America.

At the Kellog sale in New York, in June, 1883, a yearling bull, King Ashantee, brought £1,167, or $5,600; a six-year-old cow brought £396, or $1,900; and a two-year-old heifer brought £344, or $1,650. At a subsequent period, at Mr. T. S. Cooper's sale, in Connecticut, 119 Jerseys averaged £198, or $952 each; a 33-months-old heifer brought £1,073, or $5,150; and a five-year-old cow brought £583, or $2,800.

The New Zealand Stock and Pedigree Company, Auckland, has one of the largest herds of pure-bred Herefords in the colony. This breed has long been a favourite one here. They are tough, hardy, and are able to pick their food on poor soil, and when two or three years old outweigh any other breed, and are famous for their high-priced meat, that is to say, their loins are well developed, and the yield of "succulent," "porter-house," and "sirloin" parts are proportionately heavy. The hind-quarters of the New Zealand pure-bred Hereford are long from the hip backward. The thighs are large and full, and well-meated at the hocks. The whole carcase is set square on good short legs standing well apart. The flesh is firm, and the hide mellow, with soft hair, not too fine, but giving the impression that it is capable of being well stretched. The colour of this breed is a distinct red, with white face, mane, and breast, and white legs as far as the knee. As an evidence how they stand hard feed, it is said that during the long drought of 1878 and 1879 in Australia about 5 per cent. of the Herefords were lost on a run in Queensland against 10 per cent. of the shorthorn herd and 20 per cent. of the "stud" shorthorn. In one large paddock there were seventy shorthorn and seventy Hereford bulls. The shorthorns got so poor that they had to be turned out on the run, the paddocks being bare of grass, but the Herefords kept in good condition.

When Captain Cook first visited New Zealand there were no cattle in the country, but at a subsequent period some were introduced from Australia. In the early settlement of the colony the length of time occupied in a voyage from England, and the many difficulties which had to be overcome by the pioneers, prevented special attention being given to the improvement of the breed of cattle by importation, as that necessarily involved a heavy expenditure of money, not to say anything of the time and patience required; but at last the colonists improved their herds by the introduction of highly bred stock from Europe, and I have not the slightest hesitation in saying that the imported cattle thrive better in New Zealand than in their native homes, and that this superiority is developed to a still higher degree in their offspring.

The shorthorns, as I have said before, outnumber those of other breeds in New Zealand. They were amongst the first imported into the colony, and have ever since been very popular on account of the prevailing impression that they are the best suited for improving the breed of inferior cattle and adapting themselves to different kinds of soil and climate, and also that they give a larger increase of weight in less time than other cattle. Those who keep up the pure stream prefer the roan colour, though in large herds red and white are not uncommon. Any sign of black is regarded as an impurity of blood, and those so marked are not bred from, but are drafted off to the butcher. The cows of this breed are believed to give milk for a longer period, and when dry to fatten rapidly.

The largest prices ever paid for New Zealand cattle have been paid for shorthorns. Messrs. R. and E. Maclean, of Auckland District, for many years gave great attention to this breed. The famous bulls "Duke of Newcastle" and "Duke of Cambridge," now the property of the New Zealand Stock and Pedigree Company, were bred by the Messrs. Maclean. These bulls took the first prizes at the Auckland agricultural shows, and were sent to Sydney, New South Wales, in 1878. At that time they were said to be the finest specimens of cattle ever seen in New South Wales. The "Duke of Cambridge," a light roan, dam "Lady Eleanor," sire "25th Baron Wetherby," came of the celebrated Siddington tribe of pure "Bates" breed, the property of Mr. Bowley. "Duke of Newcastle," a rich roan, was calved in November, 1875; sire "9th Colonel Tregunter;" dam "Countess of Taunton," by "Duke of Somerset" (26012). Each of these bulls took first prizes in their respective classes at Sydney.

The steady demand for black polled Aberdeen Angus cattle in the United States has increased the price of this breed fully 50 per cent. in Scotland. The polled Angus, being natives of a cold climate, are of course a hardy breed, and on that account are well adapted to the severe winters of America; and, moreover, it is said they require no artificial feeding. In the climate of New Zealand, where they do not require housing, it is thought they will do even better than in colder countries. Although as yet this breed is confined principally to the South Island, they will soon be distributed throughout the colony.

Mr. W. S. Davidson was fortunate enough, while in Scotland, to secure for New Zealand the celebrated "Pride" heifer, and two yearling bulls of the Aberdeen Angus variety. Mr. Davidson also purchased for New Zealand "Solomon," of the celebrated "Sybil" family, and winner of the third prize at the Inverness show in 1883. The animal was bred by the Earl of Southesk, and is the produce of the first prize National Society's animal, "Sybil 2nd of Tillyfour" (3526), and "Knight of the Shire" (1699). The cost, like that of both parents, was considerable.

Mr. Davidson also bought from Mr. George S. Grant, Anchorachan, Glenlivet, at a high price, a yearling, son of the prize cow "Patience of Corskie" (1932).

Recently some New Zealand polled cattle have been exported to Australia. Two of these were shipped to Queensland. One of them, a yearling heifer, from Mr. Auld's cow "Pride of Aberdeen," brought the sum of 510 guineas, or $2,570; and the cow "Pride of Aberdeen" brought 385 guineas, or $1,940. These cattle were the property of the New Zealand Land Company, and were entirely grass-fed on the company's estate, near Oamaru, South Island.

The Devons, next to the Herefords, are the most numerous in New Zealand, and in time will become fully as popular.

Mr. James Dilworth, of Auckland, says that Devons are not only a superb breed, but thrive remarkably well, and that some cattle experts think them superior to the shorthorns. They are a smaller breed than the Hereford, are of a dark red colour, white nose, full eye, and fine horns. Mr. Thomas Allen, to whom I am indebted for much of the material in this report, is of the opinion that the Devon oxen are unrivalled at the plough, especially if the ground is not too heavy. They have a quickness of action which no other breed of cattle can equal. Ox labour is no longer employed in England, but years will elapse before such labour can be dispensed with in parts of New Zealand. It is said no better breed can be found for the purpose than the Devon. They have better dairy qualities than the Herefords, but do not grow or fatten so rapidly on rough feed. They are, however, profitable to the butcher, and prove to be better than they look.

Ayrshires are also a favourite breed; they come next to the

Devons in regard to numbers, and are especially adapted for the dairy. They give a large quantity of milk. They are found in New Zealand of various colours, principally red-and-white and sometimes brown-and-white. The Ayrshire steers, unlike the Herefords, do not make good beef, and are usually sold for veal, and the heifers reared for the dairy. Mr. Dilworth owns a pure-blooded heifer of this breed that at one time produced as much as 23 lb. of butter per week, and now averages from 12 lb. to 15 lb. per week.

The Alderneys are not numerous in New Zealand, and are looked upon as being fancy cattle rather than profitable. They are kept for the richness and quantity of their milk, but are not used in large dairies. They are of little value to the grazier.

In addition to distinct breeds, there is a great number of cross-bred cattle, from the longhorn down to the colonial-bred polled cattle. During the spring and summer months thousands of cattle are fattened for the butcher from the ordinary pastures without the aid of roots or artificial food. In some districts cattle are thus fattened on the open pastures all through the year. In districts subject to frost it is necessary to grow a supply of roots and hay to supplement the feed during the winter. Stall-feeding, or even housing the cattle during the winter nights, is quite the exception: pure-bred cattle kept for stud purposes are stall-fed, and on some dairy-farms the cows in milk are housed at night during winter months, grazing the paddocks during the day, but the greater number are left out all the year round without artificial shade or shelter. On many of the large runs herds of breeding cows are kept, and the calves are left to run with their mothers till they are four or five months old, when they are drafted off to a distant part of the run and weaned, out of sight and sound of each other. The young stock thus bred are reared and fattened. If the feed is not good enough they are sold to the graziers to fatten, the difference between the value of store and fat cattle being the grazier's profit. Three-year-old steers are worth in Auckland from £4 3s. 4d., or $20, to £6 5s., or $30, each; and when fat they realize from £7 6s. 10d., or $35, to £11 9s. 2d., or $55, the market being a very fluctuating one. The cattle are sold at per head, the calculation being a guess one of 100 lb. dead. It is probable, however, that the system of selling by weight will before long prevail in this colony. The auctioneer's quotations vary from 17s. 9d., or $4 25c., to £1 11s. 3d., or $7 50c., per 100 lb. of beef, but the former is often the midsummer price, and the latter the midwinter or early spring.

There are, I think, quite as many different kinds of cattle in New Zealand as in the United States, and very nearly as many as in France. Nine distinct breeds—viz., Shorthorns, Herefords, Devons, Polled Black Angus, Ayrshires, Jerseys, Alderneys, Normans, and Bretons—have come under my observation.

One of the most striking facts in connection with the cattle industry of this colony is the wonderful immunity from disease which has caused much devastation among cattle in Australia—as, for instance, pleuro-pneumonia. This dreadful disease was introduced on two occasions from Australia, but assumed a very mild type, and soon disappeared entirely, leading to the belief that pleuro-pneumonia cannot live in a climate such as that of New Zealand. Another fact almost as interesting is that cattle are much less vicious in New Zealand. Mr. Frederick Lawry says, it is well known in the Auckland District that cattle do not fight one another, and he has observed that even bulls of an equal age, when turned into a paddock, take but little notice of each other; it is also said that even in large dairy farms when fresh cows are introduced, it is not necessary to cap or cut their horns.

The cost of shipping cattle per head to San Francisco *viâ* the Pacific Mail Steamship Company is £31 5s., or $150, to £41 13s. 4d., or $200, per head. This cost would be materially lessened if sufficient numbers justified the company in making arrangements for regular shipment. The cost of transportation from London to Auckland *viâ* the direct lines of steamers has been from £42, or $200, to £52, or $250, per head. The expense of feeding on board ship, both on the San Francisco steamers and the direct service to London, is about 2s., or 48c., per day. The food consists of 25 lb. of oaten hay, 25 lb. of oaten chaff, and a little bran. The cost of transporting cattle from London to New Zealand has been reduced since the establishment of direct steamship service with this colony, and I am informed that it will be still further reduced should the regulations which prohibit the import of cattle from Europe and America be removed.

Dairy farming is carried on with profit in New Zealand by a large proportion of the settlers, especially when the family can do the work without employing much extra help. Near the large towns and cities most of the milk is consumed fresh, some farmers retailing their own milk, while others sell wholesale to the dairy companies or dealers, who often receive it by railway from a distance of from ten to thirty miles. The dealers generally pay from 5d., or 10c., to 8d., or 16c., per gallon for the milk.

Butter- and cheese-making, combined with rearing calves and pigs, is profitably followed when the distance from the towns or railway will not allow the milk to be sold fresh. Several cheese factories are in full work in different districts in the colony, much of the machinery for which has been imported from the United States. The farmers within a suitable radius supply the milk to these factories at from 3½d. to 4d., or 7c. to 8c., per gallon, and find it more profitable than making cheese on their own farms. By direction of Government a pamphlet has been prepared lately, entitled "Cheese, Butter, and Bacon in New Zealand," with the object of drawing the attention of colonists to the dairy-produce industry when carried on under the co-operative or factory system, as well as to the necessity of using *appliances suitable to the climate* in which the cattle are raised.

Companies for the erection of factories have been and are being formed, and dairy produce will in the near future form an important item in the return cargoes for the splendid lines of steamers now trading direct between London and New Zealand.

I forward copies of this little pamphlet, for the information of the Department of State.

RHODES HOUSE OXFORD LIBRARY

## FROZEN AND CANNED MEATS.

The export of New Zealand frozen meat is altogether a new industry, but it is one that bids fair to swell to very large proportions in the near future. The first experiment of this kind ever tried in the colony was by the New Zealand Land Company, near Dunedin, in the South Island. The directors of that company, stimulated by the success attending the export of frozen meat from the United States and the Australian Colonies to England, chartered the "Dunedin," a ship of about 1,250 tons, and fitted her with the necessary apparatus to receive the meat. The ship had space for 450 tons of frozen meat. Five thousand cross-bred sheep, weighing on an average 85 lb. each, were killed for the purpose, with "the bloom on," that is, were slaughtered near the run, so as to avoid the ill effects of being driven too far. The sheep were frozen, and packed in bags, so as to preserve their shape, and then carefully stowed away. The vessel sailed from the City of Dunedin on the 18th February, and arrived in London on the 24th May, 1882, after a voyage of ninety-eight days. The mutton was landed in excellent condition, and was sold readily at 7½d. (15 cents) per lb. The superior flavour of the meat attracted such general attention that the London *Times* devoted two or three leading editorials to the subject. It said, amongst other things, "that the triumph over physical difficulties was almost incredible. The mutton is the product of a very large grazing property extending over half a dozen parishes, brought from the antipodes, and discharged into our dead-meat market in a day."

The success of the enterprise was not only remarkable from the fact that it was the first shipment of fresh meat from New Zealand, but it was the first shipment ever made from any of the Australasian Colonies in a sailing-vessel. It is believed, however, that meat can be carried much cheaper by steam- than by sailing-vessels.

The New Zealand Shipping Company have all their splendid steamers in readiness for the shipment of meat. The first steamer, the "British Queen," sailed from Lyttelton in the month of April, 1883, with 10,000 carcases, weighing from 60 lb. to 100 lb. each. The cost of freight is 2d. (4 cents) per lb., and the charge for freezing is ½d. (1 cent) per lb. Other steamers of this line sailed as follow: The "Fenstanton," 2,400 tons; the "British King," 3,558 tons, in May; the "Ionic," 4,368 tons, in June; and the "Doric," 4,369 tons, in July. All these steamers took full cargoes of mutton, and a quantity of beef; they are strong-built vessels, and have sufficient speed to make the passage to London *viâ* the Straits of Magellan in about forty-five days. This company has also fitted up two fine sailing-vessels, the "Opawa" and the "Mataura," the former leaving Lyttelton and the latter Auckland.

That enterprising shipping firm, the Shaw-Savill and Albion Company, have ordered to be built by Bentley and Co., on the Clyde, three large steamers, each of 5,000 tons burden, for the New Zealand trade. They will all be fitted up in the best style, and with refrigerators for carrying meat in large quantities. The Shaw-Savill and Albion Company have also chartered a number of sailing-vessels for the same trade. The "Lady Jocelyn" sailed from Wellington, and the "Sorrento" from Port Chalmers, with cargoes of meat; the beef and mutton shipped were of the very best quality. The machine employed for freezing meat on board the "Mataura," which sailed from Auckland recently, is one of Haslam's patent dry-air refrigerators.

The process by which the meat is frozen is as follows: Immediately after the sheep or oxen are killed, and the meat has "set," they are conveyed on board and hung in the meat-room, the space of which is about 21,000 cubic feet, capable of taking in between 5,000 and 6,000 carcases of sheep. The freezing apparatus is kept constantly in motion. It is driven by an engine of 80-horse-power. The machine is capable of delivering 4,000 cubic feet of dry air per hour, at a temperature of 60° to 80° Fahr. below zero. Only two tons of coal are required to keep the machine going for the full twenty-four hours. In cold latitudes it is not found necessary to use the machine for more than four to six hours per day.

Sir F. Dillon Bell, the Agent-General for New Zealand in London, is fully satisfied that mutton from this colony can be placed on the London market at 6d., or 12 cents, per lb., and leave a good profit both for the grower and the shipper. He estimates the meat supply of the Australasian Colonies at 700,000 tons per annum. But the real limit of the supplying power of the colonies is the amount of tonnage that they can command; and, as meat can form only a portion of the cargoes of steamers or sailing-vessels, and as these vessels must secure inward as well as outward freights in order to pay, there is not much prospect of even a fourth of this quantity being reached for some years to come. At an average of 350 tons per vessel, equal to three times that tonnage in bulk, including machinery and coal, it would take about three hundred large vessels annually to carry 100,000 tons.

The meat trade in the future, at least as far as Australasia is concerned, will be from New Zealand. The high price of meat in Victoria and New South Wales is said to be exceptional, on account of the drought. Indeed, the long drought was given as a reason for the losses of the Australian Frozen Meat Company during the year 1882.

It is more than probable that the colonial exporters will soon find the English process of freezing meat an expensive one, and that they will adopt the Eastman or some other American process. In the Eastman process the machinery is very compact, and, moreover, there is not that continuous spray from the wood pipe, through which the air enters the freezing chamber of the English machine, resembling a miniature snow-storm, and making it necessary to clean it out very frequently. The American process consists of a freezing chamber, with double walls, between which is a current of air, and also a supply of asbestos, haircloths, wool, or other non-conductors. Above the chamber is a reservoir of ice, or some other cooling agent, with an adjacent pump. Cylinders are placed at suitable intervals in the chamber. From the reservoir a pipe runs to the nearest cylinder and enters it at the bottom. Another pipe runs from the top of this cylinder to the bottom of the next, and so on throughout the series. A return-pipe connects the cylinder with the reservoir.

The cooling liquid follows the course indicated. From the reservoir it is thrown by gravitation, displacing the warmer liquid therein, and forcing it up and over into the bottom of the next cylinder, and so on to the last, whence the pump lifts the warmer liquid back into the ice reservoir. The cylinders being air-tight, there is no contact with the cooling liquid, and the atmosphere in the freezing chamber may be kept at any temperature.

The demand for fresh meat in England is becoming greater every day. The annual supply of sheep alone in Great Britain has been reduced very considerably, whilst the food-supply of Ireland is so meagre as to appear startling. The falling-off in the number of cattle in the British Isles is extraordinary, nor is there any sign of improvement in this state of affairs. The colonies, of course, will be able to supply Great Britain with no inconsiderable amount of meat and grain, but that country must be mainly dependent, for some years to come, on the United States for the bulk of her food-supply. The United States ship annually to England vast numbers of live cattle. They also send to the same country about 20,000 carcases of beef every week, besides quantities of pork, bacon, and hams. The truth is, the resources of the United States, for meat production, are practically unlimited. Texas alone has over six million cattle, to say nothing of the millions of acres of land in Colorado, adjoining New Mexico and Montana, wonderfully adapted to the growth of grain, cattle, or sheep.

The export of frozen meat from the Colony of New Zealand during the year 1882 amounted to 1,707,328 lb., valued at £19,339, or $92,827. This year the export will be very much larger. The average wholesale price of beef and mutton in New Zealand is about 2¾d. (5½ cents) per lb.

## CANNED MEAT.

Until last year there has been a marked falling-off in the quantity and value of the exports of canned meat from New Zealand. During the year 1878 the total value of the exports of New Zealand preserved meat amounted to £74,225, or $356,280. In 1881 the amount declined to £22,391, or $107,476. Last year the amount increased to £54,397, or $261,105. The subjoined table shows the quantity and value of potted and preserved meat exported from New Zealand for each year from 1878 to 1882 inclusive:—

| Year. | Quantity. | Value. | |
|---|---|---|---|
| | Cwt. | £ | $ |
| 1878 ... ... ... ... | 28,292 | 74,225 | 356,280 |
| 1879 ... ... ... ... | 20,616 | 54,214 | 260,227 |
| 1880 ... ... ... ... | 15,279 | 38,563 | 185,102 |
| 1881 ... ... ... ... | 9,595 | 22,391 | 107,476 |
| 1882 ... ... ... ... | 26,016 | 54,397 | 261,105 |

The New Zealand Government has for some time past taken much pains to collect information in regard to the various methods pursued in the United States for canning meat for the British market, the cost of constructing and running the machinery, the extent of the industry, &c. Upon inquiry it was found that one London firm alone imported, during a period of eleven months, 594,000 cases of canned meat from the United States, valued at £1,041,666, or $5,000,000. The firm stated that the 2-lb. tins of American compressed meat sold readily in the London market at 6½d. (13 cents) per pound; 6-lb. tins, 6d. (12 cents) per pound; 14-lb. tins, 5¾d. (11½ cents) per pound. The same firm also gave information respecting the sizes of tins the most suitable to be used. They found the following sizes the best: 2-lb. tins, packed in cases of twenty-four each; 4-lb., of twelve each; 6-lb., of twelve each; 14-lb., of six each; the principal demand being for the 2-lb. and 14-lb. tins. In every 1,000 cases the proportion of the sizes should be about 300 cases, 2-lb. tins; 25 cases, 4-lb. tins; 125 cases, 6-lb. tins; and 550 cases, 14-lb. tins. The tins are recommended to be lacquered, and not painted, and attractively labelled. The estimated cost of a plant capable of turning out 5,000 tins a day is put down at £573, or $2,750: to this should be added the cost of freight, commissions, &c., in shipping it from New York to New Zealand. The inquiries of the New Zealand Government have led people of the colony to believe that they can, with the help of skilled labour and machinery from the United States, compete successfully with the American meat trade in the London market. Several wealthy firms in Auckland and Dunedin are so impressed with this idea that they have already ordered from New York the necessary plant for conducting the meat-canning industry on a large scale. The low price and superior quality of the New Zealand beef and mutton are certainly favourable to the success of the enterprise, but the future alone can determine whether or not these advantages are sufficient to counterbalance those enjoyed by the various meat-canning establishments of the United States.

During a recent visit to Chicago I was fortunate enough to see Mr. Philip D. Armour, who is at the head of the largest canning concern in the world. I learned from him that the principal reason why Chicago can compete successfully with New Zealand in the meat trade is that the Chicago canners have a ready market at their doors for those joints which require cooking in large pieces, and which would suffer if cut up to be canned in the 2-lb. to 14-lb. cans. They have extensive distributive facilities, sending these cuts all over the country in refrigerators, thus competing with retail butchers. The hides and tallow also fetch fancy prices as compared with what they bring in New Zealand. The cattle blood is dried and sold at a high price for fertilizing purposes; and the horns and hoofs are taken by the glue and comb manufacturers. In fact, no part of the animal is lost. Owing to all this, the cost of what is put into the cans is reduced to a merely nominal price. In this way the Chicago canners are enabled to compete successfully with the colonial meat trade. The carcase trade—a new departure this season—is destined to further reduce the cost of the canned product. Messrs. Armour and Co. have commenced sending fresh beef to eastern cities in refrigerator-cars, and find it a successful undertaking. Thus a wider market is afforded for the best cuts, and an increase in the capacity of the establishment is rendered necessary, both of which circumstances are calculated to reduce the cost of the meat reserved for the canning process. In Messrs. Armour and Co.'s house the opinion was expressed that the canning business can only be carried on as an adjunct to the regular packing business, the sharp competition between canners and the high price of cattle being the reason for this conclusion. Messrs. Armour and Co. have killed 100,000 cattle a year for the past two years. The autumn is the busiest season. The slaughter averages about 700 head a day, and ran up to 1,000 head one day, which is the largest number ever handled at the establishment in the time given. About 500 hands are employed in the canning establishment. Of this number, 100 are girls, engaged in lacquering and labelling. Mr. Armour expressed the opinion that the business of slaughtering would be done in the West. He said, "It is simply a law of nature that the bullock, like the hog, will be handled near the corn-belt. In the East they have not the facilities for killing bullocks that we have." Messrs. Armour and Co., by means of their refrigerating establishments, are enabled to kill cattle all the year round. Experience shows that beef slaughtered by them can be kept perfectly sound and good for several months. It is reasonable to believe that similar establishments to those of Armour and Co. will, at no distant date, be started in the vicinity of the great mountain ranges of Montana and New Mexico.

Figures furnished by the Hon. J. R. Dodge, statistician at Washington, give the number of beef cattle annually slaughtered in the United States at 6,250,000 head. The receipts at the stockyards of Chicago alone, in one year, were 1,498,555 head, exclusive of calves. As many as 11,163 were slaughtered in a single day.

Some disappointment has been felt in London at the result of the shipment of meat from Australia for the year 1882. Although the shipments rose from 565 tons to 1,700 tons, showing an increase of 1,135 tons over the year 1881, still, from the preparations made for the shipment of meat, a much greater increase was expected. In the month of October, 1882, the shipments were unusually large, but there was a great falling-off in the months of November and December.

The prospects of the meat trade are much brighter in New Zealand than in any other of the Australasian colonies. The New Zealand meat is not only superior in quality, but it is of a much better flavour.

In April, 1881, there were forty meat-preserving factories in operation in New Zealand: four in the District of Auckland, three in Taranaki, nine in Wellington, five in Hawke's Bay, seven in Canterbury, nine in Marlborough, and three in Otago. The number of hands regularly employed in these factories is about five hundred; the total value of the ground and buildings is estimated at £62,525, or $300,000, and the cost of machinery at £34,320, or $164,700. Some of these factories turn out the conical-shaped tins, like those of Chicago and St. Louis, so popular in the European market.

A meat-canning firm in Auckland has, in course of erection, at their spacious buildings in Queen Street, a canning plant capable of turning out 6,000 lb. of compressed beef a day. When finished this firm will have the most extensive factory of the kind in the Southern Hemisphere.

## CANNED PROVISIONS IN NEW ZEALAND.

At one time all the canned provisions consumed here were supplied by Great Britain. In the year 1870 the total value of the imports of salmon from the United States was only £750, or $3,600, against £9,933, or $47,678, from Great Britain. In 1882 the value of the imports of American salmon into New Zealand was £11,156, or $53,549. The wholesale price of good Columbia River salmon in Auckland varies from 7s. 3½d., or $1 75c., to 8s. 9d., or $2 10c., per dozen 1-lb. tins. They are packed in cases, each case containing four dozen tins.

The following are some of the brands most generally in use: Astoria Packing Company, Astoria Fishing Company, William Hume, George Hume, J. A. Devlin and Co., J. O. Hauthorn and Co., Booth and Co., Baddut Company, Fisherman Packing Company, J. W. and J. Cook, Cutting Packing Company, Kinney and Co., Hopgood and Co., R. D. Hume, Joseph Hume and Co. All are San Francisco houses.

It sometimes happens that Columbia River salmon turns out badly. Not unfrequently tainted fish are put up, and sometimes the packers fail to completely exhaust the air before the cans are hermetically sealed. If the air is not exhausted the can will become blown and, of course, the fish spoiled. The importers of Columbia River salmon tell me that they cannot give preference to any particular brand. If a shipment of a favourite brand should turn out bad the consumer is afraid to trust the brand again. Sometimes the American packers label fish taken from Rogue, Alaska, and Sacramento Rivers, as Columbia River salmon. These goods are shipped here and sold at reduced rates, but, as they are of indifferent quality, they are calculated to injure the trade in the genuine Columbia River salmon.

The following is a table showing the quantity and value of potted and preserved fish imported from the United States into New Zealand for each year since 1869:—

| Year. | Quantity. | Value. | |
|---|---|---|---|
| | | £ | $ |
| 1870 ... ... ... | 390 packages | 750 | 3,600 |
| 1871 ... ... ... | 425 cases<br>1,246 packages | 1,817 | 8,722 |
| 1872 ... ... ... | 260 cases<br>1,000 packages | 2,163 | 10,382 |
| 1873 ... ... ... | 150 cases<br>1,417 packages | 2,579 | 12,379 |

POTTED AND PRESERVED FISH IMPORTED FROM UNITED STATES—*continued.*

| Year. | Quantity. | Value. | |
|---|---|---|---|
| | | £ | $ |
| 1874 ... ... ... | 80 cases<br>8,008 packages | 10,913 | 52,382 |
| 1875 ... ... ... | 6,051 „ | 12,519 | 60,091 |
| 1876 ... ... ... | 6,215 „ | 8,912 | 42,778 |
| 1877 ... ... ... | 8,283 „ | 14,358 | 68,918 |
| 1878 ... ... ... | 8,270 „ | 15,573 | 74,750 |
| 1879 ... ... ... | 6,680 „ | 10,758 | 51,638 |
| 1880 ... ... ... | 443,272 lb. | 11,256 | 54,029 |
| 1881 ... ... ... | 596,443 „ | 17,578 | 84,374 |
| 1882 ... ... ... | 351,718 „ | 11,156 | 53,549 |

### AMERICAN CANNED FRUITS.

The trade in American canned fruits in New Zealand is increasing, although the fruit grown here compares very favourably with that of the United States. The New Zealand peaches and apricots are said to be absolutely unsurpassed in richness and delicacy of flavour, and they grow here in the greatest abundance; but there is, nevertheless, a strong prejudice in favour of American fruit. The fruits imported from the United States consist principally of pears, grapes, apricots, peaches, plums, prunes, cherries, and apples. They are put up in 2-lb. tin cans and packed in cases, each case containing two dozen cans. The duty charged on them is 15 per cent. ad valorem. The prices are fluctuating, and vary according to the supply and demand. These fruits have been sold from 8s. 4d., or $2, to 16s. 5½d., or $3 95c., per dozen cans. Among the brands used here are J. C. Kraft and Co., of Baltimore, the Cutting Packing Company, Wangenheim and Co., Code, Edfield, and Co., the San José Packing Company of California, &c.

### NEW ZEALAND CANNED FRUITS.

During the last few years some enterprise has been displayed on the part of several firms in canning fruit in New Zealand. The best qualities of peaches and apricots are selected, and the cans hermetically sealed in accordance with the mode practised in the United States. One firm at the Thames has ordered machinery from Chicago for the manufacture of tins on a large scale. Only the best quality of tin is used, and the cans are soldered on the outside. The fruits put up at the Thames and in Auckland are packed in 2½-lb. cans, and sell for about 9s. 4½d., or $2 25c., per dozen. The retail price is 1s. 0½d., or 25c., per can. The best New Zealand canned fruits that I have examined are put up by Ludlow and Co. and R. Hudson, at the Thames.

### BRITISH PRESERVED FRUITS.

The fruits imported into New Zealand from Great Britain are principally of the manufacture of J. T. Morton, and Crosse and

Blackwell, of London. They consist of rhubarb, blackberries, quinces, black-currants, pears, plums, cherries, peaches, and gooseberries. They are packed in glass bottles, each bottle holding about 2 lb. of fruit.

The value of the various kinds of fresh fruit imported into New Zealand during the year 1882 was £64,540, or $309,792, against £70,871, or $348,180, for 1881.

Fruit culture in New Zealand—especially of apples and peaches—is becoming a very important industry. The farmers and nurserymen are planting fruit-trees throughout the North Island, and in the District of Auckland there is an apple company conducting the business on a large scale. Mr. T. W. Leys, of Auckland, has furnished me with the following table showing the various kinds of fruit trees grown in New Zealand. The table is arranged in the order of their ripening; the letter D signifies dessert, and K signifies kitchen:—

*Apples.*

Joanneting (D)
Irish Peach (D)
Devonshire Quarrenden (D)
Williams's Favourite (K)
Duchess of Oldenburg (K)
King of the Pippins (D)
Lord Suffield (K)
Gravenstein (K, D)
Cellini (K, D)
Emperor Alexander (K)
American Golden Russet (D)
Cox's Orange Pippin (D)
Hawthornden (K)
Court of Wick (D)
Claygate's Pearmain (D)
Beauty of Kent (K)
Blenheim Pippin (K, D)
Dumelow's Seedling (K)
Brabant Bellefleur (K, D)
Prince Bismarck (K, D)
Alfristan (K)
Reinette de Canada (K, D)
Adams's Pearmain (D)
Ribston Pippin (D)
Newton Pippin (D)
Stone Pippin (K)
Northern Spy (D)
Boston Russet (D)
Scarlet Nonpareil (D)
Shepherd's Perfection (D)
Winter Pearmain (K)
Winter Majetin (K)
Norfolk Biffin (K)
Sturmer Pippin (D).

*Nectarines.*

Hunt's Tawny
Rivers's Orange
Roman
Balgowan
Albert Victor.

*Peaches.*

Early River
Early York
Dagmar
Alexandra Noblesse
Royal George
Grosse Mignonne
Noblesse
Miller's Mignonne
Crimson Galande
Comet
Lord Palmerston
Salwey
Hobbs's Late
Shap's Late.

*Pears.*

Citron des Carmes
Jargonelle
Williams's Bon Chretien
Flemish Beauty
Beurre de Capianmont
Brown Beurre
Louis Bonne of Jersey
Gansel's Bergamot
Beurre Diel
Marie Louise
Napoleon
Passe Colmar
Winter Nelis
Chaumontelle
Nec Plus Meurris
Uvedale's St. Germain.

### *Plums.*

Early Rivers
July Greengage
Early Orleans
Denniston's Superb
Golden Esperen
Angelina Burdett
Greengage
Damson Prune
Woolston's Black
Jefferson's
Kirke's
Washington
Denyers's Victoria
Pond's Seedling
Prince Engelbert
Diamond
Coe's Golden Drop
White Magnum Bonum
Reine Claude de Barray.

### *Figs.*

Brown Ischia
Green Ischia
White Marseilles
Malta
Brown Turkey.

### *Apricots.*

Hemskerk
Moorpark
Peach.

### *Quinces.*

Apple-shaped
Pear-shaped
Portugal.

### *Miscellaneous.*

Black Mulberries.
Lisbon Lemons.
Loquats.
Almond Papershell.
Almond Jordan.

### Californian Canned Honey.

Although there are some bee-farms in New Zealand, which produce a fair quality of honey, the people express a decided preference for honey imported from the United States. It is much clearer and of a more delicious flavour. That put up by the Cutting Packing Company, and Wangenheim, of San Francisco, comes packed in 2-lb. cans, with screw nozzles, and in 2-lb. glass jars. The price of the cans is from 10s. 5d., or $2 50c., to 12s. 6d., or $3, per dozen, and the jars from 12s. 6d., or $3, to 14s. 7d., or $3 50c., per dozen. Honey comes into the colony free of duty. It is not likely that American honey will be superseded if care is taken in packing it, and only the best quality sent.

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## NEW ZEALAND FISHERIES.

The fisheries of New Zealand have for many years been a source of great profit to this colony. Last year the whale fisheries yielded a larger income than usual, but there was a great decline in the number of sealskins exported. The cause of the decline was the vigorous enforcement of the Act of Parliament passed some years ago for the protection of the seal fisheries. No one is now allowed to catch seals during the breeding season. There are several varieties of seals found here, including the sea-lion and sea-bear, the fur of which forms a highly-prized article of commerce. The bottle-nose seal also frequents these waters.

Amongst the rare fish of New Zealand there is one deserving of especial notice. It is a species of ribbonfish, and, as it is peculiar to this colony, Dr. Von Haast, an eminent scientist, in charge of the Colonial Museum at Christchurch, has given it the name of *Regalecus pacificus*. Several specimens of the *Regalecus pacificus* have been caught off the coast of the South Island, measuring over 12 feet in length and 13 inches in breadth. The skin of this fish is covered with a coating like frosted silver, which adheres readily to the fingers. Its head is a marvel of beauty, and possesses a crest of bright-red spines on the top. The dorsal fins consist of a number of slender rays, which do not project beyond the margin of a thin membrane by which they are united. In one of these fish, recently caught, the rays stand at a distance of about 3¼ inches from each other. At first they are about 1 inch high, and increase gradually in height to 2¼ inches.

There are several varieties of New Zealand sharks, the skins of which, it is said, are used in the manufacture of jewellery. The skin when dried and cured takes a polish equal to that of stone, and bears a strong resemblance to the fossil coral porites. The teeth of the shark are prized by the natives of the Ellis Group and other islands for their spears and other weapons of war. The teeth of the shark are serrated or saw-edged. A hole is drilled through the upper part of each tooth, which is then tied to a piece of hard wood by means of a strong fibre. The hilts of swords are protected by cross-pieces with the teeth fastened on them in the same way. These weapons make such frightful wounds that the natives, in order to protect themselves, put on an armour made of rope before going into battle.

The swordfish, common to New Zealand waters, are also worthy of notice. They resemble the mackerel in shape. Two species have been observed: one is the well-known *Xiphias gladius*, to which species the term swordfish is usually restricted. It seems to be found in most seas, and is especially plentiful in the Mediterranean and in some parts of the North American coasts. It attains a large size; specimens from 12 to 15 feet in length, with a sword over 3 feet, have been obtained. The sword is formed by the coalescence and extension of certain bones belonging to the upper part of the head. It is flat and oar-shaped, and is usually about 3 inches wide at the base, tapering gradually away to a broad blunt point at the apex. According to Dr. Gunther the sword forms a most formidable weapon. He states that they never hesitate to attack whales and other large cetaceans, and by repeatedly stabbing these animals generally retire from the combat victorious. The cause which excites them to these combats is unknown; but they follow the instinct so blindly that they not rarely attack boats or large vessels in a similar manner, evidently mistaking them for cetaceans. Sometimes they actually succeed in piercing the bottom of a ship, endangering its safety; but, as they are unable to execute powerful backward movevents, they cannot always withdraw their swords, which are broken off. The flesh of the swordfish is white, well flavoured, and nourishing. The tunny-fishers of Italy frequently catch the swordfish in their nets, and its flesh is sold by them as readily as that of the tunny. Swordfish flesh has also recently found its way into the New York markets, the fish being principally harpooned in Long Island Sound.

The second species of swordfish found in New Zealand waters is called *Histiophorus herschellii*. It is rather smaller than the common species, rarely exceeding 10 feet in length. The sword is much smaller, and round instead of being flat. Not much is known of its habits, but it has been observed at the Cape of Good Hope as well as in New Zealand. The waters of New Zealand are also frequented by the dolphin and grampus. The fiords on the west coast of Otago, in many respects even more remarkable than those of Norway, contain many curious specimens of sea mammalia that have not yet been fully described on account of the imperfect knowledge of them.

Dr. Hector is of the opinion that the various kinds of fish in the New Zealand seas represent the characteristic forms of the Southern or Lusitanian Province of the European coasts. Of thirty-three sea fishes that are used as food in New Zealand, the hapuku, tarakihi, trevally, moki, ana, rawaru or rock-cod, wrasse, and patiki are found off all parts of the coast. The snapper, mullet, and gurnard are met with in the north. The trumpeter, butterfish, and red cod appear to be confined to the south. Of the fish that are pelagic in their habits, and roam over a wide range of ocean, the largest number, such as the frostfish, barracouta, horse-mackerel, kingfish, dory, warehou, mackerel, and garfish, are visitors from warmer latitudes.

There are quite as many different kinds of edible fish in New Zealand as are found in Great Britain. About 192 fishes have been described, some of which are only known from single specimens. Of 140 species enumerated by Dr. Hector, 67 are peculiar to New Zealand; 75 are common to the coast of Australia; 10 are found in New Zealand and other places, but not in the Australian seas. The following is a table of the various kinds of fish found in the New Zealand market:—

| | |
|---|---|
| Hapuku | Oligorus gigas |
| Kahawai | Arripis salar |
| Red schnapper | Anthias richardsoni |
| Schnapper | Pagrus unicolor |
| Tarakihi | Chilodactylus macropterus |
| Trumpeter | Latris hecateia |
| Moki | Latris ciliaris |
| Frostfish | Lepidopus caudatus |
| Barracouta | Thyrsites atun |
| Horse-mackerel | Trachurus trachurus |
| Trevally | Caranx georgianus |
| Kingfish | Seriola lalandii |
| John dory | Zeus faber |
| Boarfish | Cyttus australis |
| Warehou | Neptonemus brama |
| Mackerel | Scomber australasicus |
| Rock-cod | Percis colias |
| Gurnard | Trigla kumu |
| Mullet | Mugil perussii |
| Sea-mullet | Agonostoma forsteri |
| Wrasse (spotty) | Labrichthys bothryocosmus |
| Butterfish | Coridodax pullus |
| Haddock | Gadus australis |
| Flounder or patiki | Rhombosolea monopus |
| Sole | Peltorhamphus novæ zelandiæ |
| Garfish | Hemiramphus intermedius |
| Grayling | Prototroctes oxyrhynchus |
| Smelt | Retropinna richardsoni |
| Kokopu | Galaxias fasciatus |
| Minnow | Galaxias attenuatus |
| Sand-eel | Gonorhynchus greyi |
| Anchovy | Engraulis encrasicholus |
| Pilchard or sardine | Clupea sagax |
| Sprat | Clupea sprattus |
| Eel (tuna) | Anguilla aucklandii |
| Black-eel | Anguilla australis |
| Conger-eel | Conger vulgaris |
| Silver-eel | Congromuræna habentata |

| | |
|---|---|
| Red cod | Lotella bacchus |
| Whiting | Pseudophycis breviusculus |
| Ling | Genypterus blacoides |
| Turbot | Ammotrites guntheri |
| Brill | Pseudorhombus scaphus |
| Leatherjacket | Monacanthus convexirostris |
| Smooth-hound | Mustelus antarcticus |
| Stingaree | Trigon thalassia |
| Skate | Raja nasuta. |

Of these fish the hapuku is always a great favourite. It bears a striking resemblance to the celebrated Murray cod, of the rivers of Australia. The hapuku, however, never enters fresh water, but is a deep-sea fish, although often captured near the coast. Its average weight is about 45 lb. Specimens have been caught weighing 130 lb. The head and shoulders are described as being very delicious. The kahawai, often called the native salmon, afford great sport to anglers. They sometimes weigh between 7 lb. and 8 lb.; but the meat is dry in the large size. In the early stage of their growth they are spotted like the trout. The schnapper is another very valuable fish. It frequents shallow water, and is caught with hook-and-line. Its average weight is from 4 lb. to 5 lb. It is remarkable for its abrupt profile and the brilliant metallic lustre of its scales. The trumpeter is the best flavoured of all the New Zealand fish, and is very abundant. It is also found in Tasmania and Victoria. The frostfish is often met with in the market. It is not obtained by fishing, but is found after cold, frosty nights cast up on the shore by the long roll of the ocean swell. The barracouta is so called from its resemblance to the baracouda pike of the tropical parts of the Atlantic. There are three or four kinds of flatfish, all of which are of fine flavour. The Patiki, one of these, is very common. The Maoris spear them in clear, shallow water; the flesh is tender and delicious. There are some excellent fresh-water fish, such as the upokororo (the Native name of the grayling), the kokopu, the family of Galaxidæ, Mangawai smelt, and others. The New Zealand smelt belongs to the true Salmonidæ. It was first described by Richardson. Dr. Hector, in a very valuable paper on New Zealand salmonoids, distinguishes two species of the smelt, the inanga and the proper smelt. His first acquaintance with these fish was in 1863, at the mouth of the Kakuka River, on the west coast of Otago. He found the Maoris catching them with flax nets. One specimen was 7 inches in length. The smaller variety averaged about 2 inches in length: these he believed to be one of the several kinds of young fish that are called whitebait. Both the large and small ones are delicious food.

Much interest is felt here in the electrical fishing apparatus of Professor Baird, of Washington. It has always been a favourite pastime with the Maoris to search for fish at night by means of a torch. They are not unfrequently to be seen standing in the bows of their boats with a pan resting on their shoulders filled with burning kauri gum, which emits a very beautiful light, and enables them to readily detect the fish and spear them.

The satisfactory results obtained from a small consignment of salmon ova received from California at Napier in November, 1875, induced the Auckland Acclimatization Society to devote no inconsiderable part of its revenue to the cultivation of American salmon in

New Zealand. Communication was opened with Professor Baird, of the United States Fish Commission, who agreed to supply the ova free of cost, and exhibited the utmost interest and sympathy in the object. Mr. J. C. Firth, of Auckland, superintended the preparations made to receive the consignment, and, at considerable personal expense, made special journeys to deposit the ova at the Horatea and Rapurapu Stations. He also bore the whole cost of the shipment of 100,000 ova from California. Professor Baird, on receiving the order, sent double the number asked for. In all, three consignments have been imported. From the first of these three lots only a few fish, comparatively speaking, were hatched; so that the success of the undertaking will principally depend on the importations of 1876 and 1877, placed in about equal proportions in the Waikato, Thames, and Northern Wairoa Rivers.

There can be no doubt that on each of these streams large numbers of the ova were successfully hatched, and the young fry were observed making their way down to the sea. Beyond this we have, up to the present time, received no reliable information respecting the fish. It is true that statements have been circulated respecting the capture of young salmon by Maoris and others, and accounts have been received of fish, supposed to be salmon, having been seen in the rivers. No specimens, however, have been examined by competent authorities, and it is exceedingly easy for people possessing no special knowledge of the appearance of young fish of the salmon family to make mistakes in matters of this kind. As nearly seven years have elapsed since the first consignment was introduced (or nearly six years since the date of the first large importation), many people have assumed that the experiment has proved to be a failure.

Mr. T. F. Cheeseman, the secretary of the Auckland Acclimatization Society, says: "I cannot believe that the attempt to cultivate salmon in New Zealand will prove unsuccessful, for the following reasons: From what is known of the habits of the Californian salmon it is certain that the young fish make their way down to the sea shortly after hatching, and remain in the sea or estuaries for several years; sometimes, however, taking short runs up the rivers. They do not appear to be fit for reproduction until about four years old, when they proceed up the rivers to deposit their ova. From this it is obvious that for four years after the hatching of the ova we could hardly expect to see much of the fish. Again, although the fish hatched from 70,000 or 100,000 ova might amount to a good round number, yet, when we consider the enemies which—like the fry of all fish—they would have to contend with, first in the fresh-water streams and later when they reached the sea, there can be no doubt that the number spared to reach maturity would be small; perhaps so small that they might proceed up a large river without being observed. It must also be remembered that any number of young fry might go down the river to the sea without attracting much attention, as they would be confounded with the white-bait, inanga, and other small fish so common in our rivers. But when the adult fish ascend the rivers, then we may expect to hear something of the salmon." Taking the breeding age of the Californian salmon at four years, this would not be until eight years after the importation of the ova—that is, about the year 1884. To my mind it will be premature to question the success of the importations until after this date. It is well enough to mention that the facts relating to the introduction of the British salmon into Tasmania strongly corroborate this view. Salmon ova were brought from Britain, hatched in a suitable establishment on the Derwent River, and turned out into the stream. For years nothing was heard of the fish, and most people believed the introduction a complete failure. After the lapse of ten years a few grilse were caught in the lower part of the river. The next year they were abundant, and have been steadily increasing ever since. Evidently the mature fish from the original ova had passed up and down the river unnoticed, and it was not until their progeny became mature that the fish were observed.

The value of the total imports of preserved fish into New Zealand for the year 1882 was £26,581, or $127,589, against £36,422, or $174,826, in 1881, showing a decline of £9,841, or $47,237. The Collector of Customs at Auckland informs me that the imports of American salmon up to the 30th June, 1883, are much larger than usual, and that we may reasonably expect that the imports for 1883 will be larger than those of any previous year. In 1870 the value of preserved fish imported from America into New Zealand was only £750, or $3,600. In 1873 the amount increased to £2,579, or $12,379. The subjoined table shows the value of the imports of potted and preserved fish from America into New Zealand for each year from 1873 to 1882, inclusive:—

| Year. | Value. | | Year. | Value. | |
|---|---|---|---|---|---|
| | £ | $ | | £ | $ |
| 1873 ... | 2,579 | 12,379 | 1878 ... | 15,573 | 74,750 |
| 1874 ... | 10,913 | 52,382 | 1879 ... | 10,758 | 51,638 |
| 1875 ... | 12,519 | 60,091 | 1880 ... | 11,256 | 54,029 |
| 1876 ... | 8,912 | 42,778 | 1881 ... | 17,578 | 84,374 |
| 1877 ... | 14,358 | 68,918 | 1882 ... | 11,156 | 53,549 |

The recent successful shipment of a large quantity of New Zealand frozen fish to London, by Mr. Williams, of Auckland, will very naturally direct general attention to the fisheries of this colony. During the last few years the exports of dried and preserved fish have increased. There are now twenty-two fish-preserving establishments; but none of them are conducted on a large scale. The value of the exports of dried and preserved fish (the produce of the colony) during the year 1882 was £126 ($605), against £59 ($283) for the year 1881.

The common grey mullet (*Mugil perusii*) forms the bulk of these exports. It is found principally in the North Island. It frequents the tidal rivers, going out to sea in the summer, and returning in the winter. They are caught either with nets or bait. Dr. Hector says that the mullet excels all other New Zealand fish in richness. The Natives often capture them on moonlight nights when paddling their canoes close to the banks of the streams. The fish are startled by the sound of the paddle, and leap out of the water and fall into the canoe. Australia is the principal market for the mullet, although there is a growing demand for it for the Island trade. A favourite method of preparing the mullet for market is to dry and smoke them. The process is a very simple one. The fish are cleaned and flattened out, and smoked for about twenty-four hours. They are then put in a box, being carefully packed in layers, with a sheet of paper between each layer. The box is then nailed up and ready for export.

Some of the fish-preserving establishments pursue a method of canning similar to that practised in California. The tins used by them, however, are much heavier and thicker than the American ones. Pease and Co., of Whangarei, have won a well-deserved reputation for the superior quality of their preserved mullet. The wholesale price of New Zealand mullet is 7s., or $1 68c., per dozen, whilst the price of the California salmon is 8s. 6d., or $2 4c., per dozen, duty paid. The duty charged on California salmon is 1d., or 2 cents, per lb. This duty, it is thought, will either be repealed or increased. It is certainly not prohibitory when the excellent quality of the California salmon is taken into consideration. The New Zealand duty on smoked, dried, pickled, and salted fish is 2s., or 48 cents, per cwt.

## OYSTERS.

Four species of oysters inhabit the coast of New Zealand. Of these the most important is the common rock oyster (*Ostrea glomerata*). This species, Mr. Cheeseman informs me, appears to be confined to the northern half of the North Island, and is very abundant on rocky ground in the many sheltered harbours and creeks on the eastern coast between Auckland and Mongonui. In the numerous inlets of the Kaipara and Manukau Harbours they are also plentiful in the mangrove swamps, affixing themselves to the trunks and roots of the mangroves. In all localities they are confined to the narrow strip laid bare at low water, and attain their maximum degree of development about halfway between high- and low-water marks, and are seldom found in any numbers as far as the low-water marks of spring tides. Mr. Cheeseman says that comparatively few observations have been made as to their rate of growth, or, in fact, on any part of their history. It is believed, however, from noticing their growth on the stone embankments lately constructed in Auckland Harbour and elsewhere, that they do not attain their full size and development in less than from five to seven years. Little also is known as to the time when the young oyster is produced.

In the early history of the colony thousands of tons of oysters were stripped from the rocks and burnt for lime, and it is said that even now this practice has not altogether ceased.

The annual consumption of oysters for food has increased steadily, but there are at present no means of obtaining accurate statistics as to the quantity used. Until recently the supply for the Auckland market was obtained principally from the Waiheke, Maraetai, Mahurangi, and Coromandel, the oysters from the last-named place having a special reputation for size and flavour. It is now said that many of the old oyster-grounds are exhausted, and that large quantities are brought by steamers from Whangarei, the Bay of Islands, and even farther north. The amount consumed in the District of Auckland would probably not equal that shipped to the southern districts. During the season almost every steamer carries large consignments to the southern cities, and recently small quantities have been exported to Australia. The mud oyster, which by some is considered to be identical with the English oyster, but is more probably distinct, is not common in the north of the colony, but is very plentiful in the south. It is said to be collected largely for the Dunedin market.

In all countries where there is a large and regular consumption of oysters the natural beds have been found soon or later to be insufficient. France, it is said, is the first country that undertook to remedy the evil through artificial cultivation in what are called oyster parks, and with very good results. Oyster cultivation is now carried on extensively not only in France, but in the Netherlands, in Norway, and in the United States and Great Britain.

In the United States the natural oyster-beds are more extensive than those of any other country in the world, but even there the vast quantities consumed and exported have led to the rapid depletion of the beds, and they have to be supplied with fresh seed in order to keep up the production. The same result will follow inevitably in New Zealand if these delicious bivalves do not receive the protection which their great value as a food-supply demands. The New Zealand oyster is, I think, unsurpassed in richness and delicacy of flavour. The practice of bottling them without their liquor is to be deplored. They are best eaten off the shell. Great care should be taken in cooking them not to harden the albumen. The reason why they should be eaten raw is that the fawn-coloured mass, which is the delicious portion of the fish, is its liver, and is simply a mass of glycogen. Associated with the glycogen, but withheld from actual contact with it during life, is its appropriate digestive ferment, the *hepatic diastase*. The mere crushing of the oyster between the teeth, it is said, brings these two bodies together, and the glycogen is at once digested without any other help than the diastase. When cooked, the associated digestive ferment is destroyed, and the oyster has to be digested by the eater's own digestive powers.

## WHALING.

The presence, in the waters of New Zealand, of a fleet of American whaling vessels from New Bedford, Massachusetts, directed my attention to the condition of the whale fisheries of this colony. The principal ports of New Zealand for whaling vessels are Russell and Mangonui. There appears to be no reason why these ports should be preferred to others of the colony, unless it is that Russell and Mangonui are small places, and do not offer so great inducements as the larger cities to the men to desert their ships.

The whale fisheries of New Zealand, like those elsewhere, have declined during the last thirty years, and do not appear to be rallying again. The cause of their decline has doubtless been the substitution of other material for whalebone, and the discovery of kerosene and other lubricating oils, which have taken the place of whale and sperm oil. A number of whaling stations were established along the coast of New Zealand as far back as 1825. The industry was then a very lucrative one; few ships that ventured to these shores were unsuccessful in obtaining cargoes of oil and bone.

The industry was most successfully pursued by what were known as "shore-parties," who located themselves at eligible points along the coasts. The method of catching whales by shore-parties was first started in New Zealand by some of the rough white adventurers from the Australian Colonies, who had for many years previously pursued the arduous life of catching seals in boats and small craft along the coasts of the South Island and Foveaux Strait. They were encouraged to engage in the pursuit of the whale and to form establishments for that purpose on the shores of Cook Strait. The success of these shore-fisheries led to the establishment of whaling stations at Wellington. Some also were started on the West Coast, near New Plymouth, and at various places on the East Coast, between Cape Palliser and East Cape. These stations were fitted out for the capture of the black or "right" whale (*Balæna antipodum*), which approached the shores of New Zealand in large numbers during the calving season, from May to October. Very frequently the sperm whale, the hump-back, the pike-headed, and other species came near enough to be captured. The stations were generally established near a projecting headland, close to which there was deep water, and where a good view could be had of the offing and of any whales which might chance to sport there. The season for which the men engaged themselves began with the month of May, and lasted until October, extending through a period which in New Zealand includes the winter season. During these months the cow-whales resort to the coast with their young calves.

It required a large sum of money to equip a whaling station. A pair of shears had to be erected in order to raise the immense carcases above water, so that they could be more conveniently and expeditiously cut up. It was also necessary to build "try-works," as they were called, that is furnaces for melting the blubber. Storehouses were erected. Three or four well-built and well-found boats completed the outfit. All these establishments seem to have been conducted on the same system. The men employed in the active part of the work received a certain percentage of the oil procured, and the remainder was the share of the merchant at whose expense the station had been fitted up, and who had also the advantage of taking the oil at his own valuation, which generally was largely in his favour. In looking over some old records kept at one of the stations near the East Cape I find that in one year forty-one whales were caught, which yielded 145 tuns of oil and 1½ tons of bone. I have been informed by old whalers here that as much as 14 tuns of oil had been obtained from one whale. A breeding cow and calf produce about 1 cwt. of bone to 1 tun of oil.

The flourishing condition of the fisheries attracted vessels. In 1843 as many as twenty whaling vessels were seen at one time at Port Chalmers, in the South Island. At a later period Russell, Bay of Islands, became the favourite resort of the whalers. The fisheries, however, began to decline, notwithstanding the employment of an increased number of boats and men. The places which were once the favourite haunts of whales soon became deserted. The country at that time was without a representative form of government, and no laws were enacted to protect the fisheries. The whales frequenting the coast of New Zealand were soon extirpated or driven off to other waters. They were attacked by the shore-parties the moment they reached the coast, when they had generally by their sides calves too young to support themselves, and which perished as a natural consequence. Had it been unlawful to kill the whale until later in the season, many of the calves would have been spared to return the following year.

The proprietor of one of the whaling stations has described to me the method of catching the whale by the shore-parties. The men are enrolled under three classes, viz., headsman, boat-steerer, and common man. The headsman is the commander of a boat, and his post is at the stern, except during the time of killing the whale, which honour falls to his lot. The boat-steerer pulls the oar nearest to the bow, always steering under the direction of the headsman. The common men have nothing to do but ply their oars according to orders, except one, called the tub-oarsman, who sits near the tub containing the whale-line, and sees that no entanglement takes place.

The wages are the shares of the profits of the fishery, apportioned to the men according to their rank. A code of etiquette, or laws, exists among the whalers. This code has been handed down by tradition, and is faithfully adhered to. It regulates and settles the various claims to the whale. It is a rule among them that he who once made fast to the whale has the right to it, even should he be obliged to cut his line, provided his harpoon remains in the whale. Each harpoon has its owner's private mark, and there can be no dispute about the ownership of the weapon. The boat making fast to the calf has a right to the cow, because the cow will not desert her young. A boat demanding assistance from a rival party must share equally. These unwritten laws are universally recognized among whalers. A dispute seldom occurs as to the ownership of a whale. Should such a dispute arise it is always satisfactorily settled according to custom.

The whale-boat used by the shore-parties differs in size and construction from those used by whaling vessels. The former is clinker-shaped, sharp at both ends, and is higher out of the water at the bow and stern than it is amidships. It is usually about thirty feet long, narrow, and especially adapted for riding upon the surf. A platform is erected at the stern, reaching forward about six feet, even with the gunwales. To this is attached a cylindrical piece of wood called "the loggerhead," used for checking the whale-line, and it is a custom to cut a notch in this for every whale killed by the boat.

A constant look-out for whales is kept from a site near the station, and when a whale is sighted three or four boats are immediately launched and proceed towards the spout of the whale, which, like a small column of smoke, indicates the direction to be taken. When the fastest boat reaches the whale the headsman drives the harpoon straight into the animal. A turn is taken around the loggerhead to check the rapidity with which the line runs out, and the boat flies through the water. The skill of the headsman is now shown in steering and in watching the course of the whale. Other harpoons are thrown into the animal, which, after diving several times, soon becomes exhausted. The headsman then lets fly his lance into the spot where life is said to be. The animal spouts thick blood and is a sure prize. This method of catching whales is, however, not so satisfactory or profitable as that pursued by whaling vessels, and is now principally practised by the Maoris.

The sperm whale is frequently met with in the New Zealand waters. Mr. Eldridge, the first officer of the American barque "Janus," informed me that during March, 1881, he saw fifty of these whales near the East Cape. The sperm whale travels at the rate of four or five miles an hour. Adult females, or those with young in their company, evince a strong affection for each other, and when one is killed or sustains injury the others hover about, and even render assistance. The whalers take advantage of this trait, and kill a number before the others make off. When, however, a company of male whales are found, and one is attacked, all the others desert their wounded companion. The whale will sometimes lie with its mouth wide open as if baiting for the "squid," its principal arti[illegible] of food, and will close upon it like a trap. Some say that the squid is attracted by the pearly teeth of the whale. The sperm whale is known by the act of blowing, which is performed with regularity every ten minutes. The spout sent up can be seen at a considerable distance. When one is sighted, the boats leave the ships very quietly, the men making as little noise as possible with their oars. On being struck the whale generally sounds, or descends to a great depth, taking out the lines belonging to the boat. When spent with the loss of blood it becomes unable to sound, and moves rapidly along the surface, towing the boats after it. If it does not turn, the men draw in the line and despatch it.

When a whale is killed it is brought alongside the ship. A hole is cut at the back of the head, a hook is inserted, and the fat or blubber is cut in long spiral-shaped strips and hoisted on deck. The head is opened and the spermaceti taken out. The fat is boiled on board in the furnaces, the scraps serving as fuel. The oil is put in casks. It is generally supposed that it is water which the animal propels through its vents, but such is not the case. It propels the vapour of water just as all animals expire their breath, only the vapour on coming in contact with the cold air immediately condenses in a white cloud.

Sperm whales travel the seas in herds, and they are said to acknowledge a leader, who swims in advance and gives the signal for combat or flight by uttering a peculiar roar. The sperm whale can remain under water for over an hour at a time; sometimes it leaps out of the water fully twenty-five feet into the air and shows its entire body. The neck vertebræ of the sperm whale are fused together. The upper surface of the broad shoe-shaped skull has a large basin-like cavity, wherein the spermaceti is lodged. The sperm whale is also remarkable for the ambergris which is sometimes found in it. Ambergris is the most precious of all the ingredients used in the manufacture of perfumes. It is now very generally acknowledged to be a morbid secretion from the liver of the spermaceti whale. It is remarkable that the two most precious products of the sea, ambergris and pearl, are the results of disease. Ambergris is also found floating on the ocean and is sometimes washed ashore. It is a little lighter than water, and bears some resemblance to the bark of a tree. It is described as of a waxy nature, streaked with yellow, grey, and black, and emitting a peculiar aromatic odour. It fuses at 140° to 150° Fahr., and at a higher temperature gives out a white smoke, which condenses in a crystalline fatty matter. It varies in size from 1 lb. to 30 lb., but occasionally pieces are found weighing from 100 lb. to 200 lb. Its use in the manufacture of perfumes is not so much on account of its fragrance, as the peculiar property of causing other ingredients to throw out their odours. It is compared, in this respect, to mordants in dyes, without which the colour would fail to become permanent. Perfumes that contain ambergris are very expensive, and those made without it smell of alcohol. It varies in price from £2 10s., or $12, to £10 8s. 4d., or $50, per ounce.

Among the whales peculiar to this colony is the New Zealand *Berardius*. It is a species of xiphoid whale. One was captured not long ago off the coast of Canterbury. It was described by Dr. Julius von Haast as 30½ feet long, of beautiful velvety-black colour, with a greyish belly. The female *Berardius* gives birth to a single young one in the autumn. These whales feed chiefly on cuttlefish. The skull is most peculiar in having two crests at the occiput, of most unequal size and figure, and the cheekbones at the roof of the beak are raised into a pair of huge elevators. The upper jaw is toothless, and the lower jaw has only two or three small teeth. The neck vertebræ are united, and, moreover, the stomach is remarkable, even among cetacea, for the number of chambers it contains, there being six or seven divisions.

The right whale (*Balæna antipodum*) is often caught in the New Zealand waters. In this animal the baleen plates, or whalebone, take the place of teeth, and hang suspended from the roof of the mouth. The baleen plates vary in size from a few inches to 12 feet in length. Their chemical composition is albumen, hardened by small particles of phosphate of lime. In their natural state they are of a bluish-black colour, striped with white. They are covered with small fibres, which are carefully scraped off; the plates are then boiled until they are soft enough to cut; the colour being objectionable they are dyed black before being sent to market. The dyeing is generally done during the process of boiling.

Captain Fisher, of the American whaling barque "Alaska," when at Russell, Bay of Islands, informed me that he had cruised off the coast of these Islands for a period of six years, and during that time he had taken over 7,000 barrels of sperm oil, which he thought was above the amount taken by any other vessel in the same length of time. He took home with him on the preceding voyage, according to the *New Bedford Republican Standard*, the most valuable cargo of sperm oil ever brought to that place, which is a good deal to say, inasmuch as New Bedford is the largest port for whaling vessels in the world.

I give below a table showing the quantity and value of whalebone, whale oil, and sperm oil, exported from New Zealand for each year from 1869 to 1882, inclusive:—

| Year. | Whalebone. | Whale Oil. | Sperm Oil. | Value. | |
|---|---|---|---|---|---|
| | lb. | Gals. | Gals. | £ | $ |
| 1869 ... | 5,143 | ... | ... | 305 | 1,464 |
| ,, ... | ... | 22,541 | ... | 3,938 | 18,902 |
| ,, ... | ... | ... | 7,640 | 1,676 | 8,044 |
| 1870 ... | 5,959 | ... | ... | 338 | 1,622 |
| ,, ... | ... | 23,454 | ... | 4,049 | 19,435 |
| ,, ... | ... | ... | 134,274 | 21,700 | 104,160 |
| 1871 ... | 3,017 | ... | ... | 252 | 1,209 |
| ,, ... | ... | 3,893 | ... | 568 | 2,726 |
| ,, ... | ... | ... | 42,920 | 11,725 | 56,280 |
| 1872 ... | 6,712 | ... | ... | 760 | 3,648 |
| ,, ... | ... | 14,332 | ... | 3,022 | 14,505 |
| ,, ... | ... | ... | 7,469 | 1,849 | 8,875 |
| 1873 ... | 5,784 | ... | ... | 212 | 1,017 |
| ,, ... | ... | 26,325 | ... | 3,934 | 18,883 |
| ,, ... | ... | ... | 6,958 | 2,057 | 9,873 |
| 1874 ... | ... | 30,386 | ... | 3,896 | 18,700 |
| ,, ... | ... | ... | 6,964 | 2,110 | 10,128 |
| 1875 ... | 1,792 | ... | ... | 55 | 264 |
| ,, ... | ... | 20,845 | ... | 4,100 | 19,680 |
| ,, ... | ... | ... | 10,085 | 3,796 | 18,220 |
| 1876 ... | 1,120 | ... | ... | 101 | 484 |
| ,, ... | ... | 8,791 | ... | 875 | 4,200 |
| ,, ... | ... | ... | 18,572 | 6,070 | 29,136 |
| 1877 ... | 16,072 | ... | ... | ... | ... |
| ,, ... | ... | 6,048 | ... | 790 | 3,792 |
| ,, ... | ... | ... | 15,047 | 4,032 | 19,353 |
| 1878 ... | 5,320 | ... | ... | 371 | 1,780 |
| ,, ... | ... | 37,801 | ... | 7,718 | 37,046 |
| ,, ... | ... | ... | 17,483 | 4,841 | 23,236 |
| 1879 ... | 3,136 | ... | ... | 948 | 4,550 |
| ,, ... | ... | 3,640 | ... | 728 | 3,494 |
| ,, ... | ... | ... | 15,707 | 3,745 | 17,976 |
| 1880 ... | 3,584 | ... | ... | 603 | 2,894 |
| ,, ... | ... | 2,160 | ... | 265 | 1,272 |
| ,, ... | ... | ... | 23,969 | 5,251 | 25,204 |
| 1881 ... | 1,120 | ... | ... | 132 | 633 |
| ,, ... | ... | 5,783 | ... | 780 | 3,744 |
| ,, ... | ... | ... | 23,186 | 5,459 | 26,203 |
| 1882 ... | 3,472 | ... | ... | 51 | 244 |
| ,, ... | ... | 11,991 | ... | 1,467 | 7,041 |
| ,, ... | ... | ... | 18,824 | 4,541 | 21,796 |

In 1878 the number of whaling vessels which arrived in the various ports of New Zealand was twelve, with an aggregate tonnage of 3,463. In 1879 the number was fifteen, and the tonnage 3,792. In 1882 the number was twelve, with a tonnage of 3,326.

In 1858 the Legislative Assembly of New Zealand, with a view of improving the condition of the whale fisheries, passed an Act, which is still in force, requiring the proprietors of whaling stations to give valid security on future produce of oil and bone. There had been very general complaint among the whalers that the merchants would not advance money or goods without legal security. The Act enabled the merchant to receive a mortgage on the oil and bone which the proprietors of the whaling stations might obtain during the ensuing season. The mortgage must be in duplicate, and recorded, so that no subsequent sale by the whaler can affect the security. If the whaler should refuse to deliver the oil and bone specified therein, the owner of the security can take possession of the same. This security is made transferable by deed and by indorsement, and every transferee has the same right, title, and interest as the person in whose name such security was originally taken. The security can also be cancelled by the Registrar at any time, at the request of the owner. The Act further provides that, if fraud should be practised on the owner, he can recover double the amount of the consideration named in the mortgage.

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## KAURI GUM.

Kauri gum, which is so extensively used in the United States for the manufacture of varnish, is a product peculiar to New Zealand. It consists of the dried and solidified sap of the kauri tree, a species of pine known to botanists as the *Dammara australis*. This tree does not exist in any other part of the world. It is found only in that part of the colony lying to the northward of 39° south latitude. But within the last few years a good deal of gum has been found in the swamps of the Waikato Valley, and 38° south may be regarded as its extreme limit southward. It is certain, however, that the tree does not now grow in the Waikato District, the climate being too cold. A few kauri trees are to be found in an isolated clump in a forest about forty miles to the southward of Auckland; but no young trees are growing up among them; and, as it is in the neighbourhood of several ancient volcanic points of eruption, probably when they grew the climate of the locality was warmer than it now is. To the northward of Auckland, however, is the great district where the kauri is found at the present time, and there, too, the largest quantities of the kauri gum are found.

It was the opinion of many for a long time, and I doubt not is the opinion of many still, living out of New Zealand, that kauri gum is a fossil article, like amber, and is no longer being produced. This, of course, is a mistake; but it is nevertheless true that the best and by far the largest quantity of merchantable kauri gum is dug out of the ground. It is found at various depths, from just above the surface of the soil to many feet below the surface. The places where it is found in greatest abundance are places which have been in former ages covered with the kauri-pine tree, but which are now generally bare of forest growth. It is found on bare hillsides, on flat clay lands, in swamps, and even in some places that are covered with a more or less thick coating of volcanic *débris*. As a rule, however, the kauri tree loves a clay soil and subsoil, and is generally found growing upon steep hillsides.

The open land where kauri gum is dug out of the soil is generally covered with various species of ferns, principally *Pteris esculenta, Pteris incisa, Pteris macilenta, Pteris scaberula, Pteris tremula,* &c.; and the principal vegetation of the swamps where it is found is a plant known to the Maoris as raupo, the *Typha angustifolia* of the botanist.

Not unfrequently around the edges of these swamps, and along the low-lying portion of the flat land where kauri gum is found, grows in abundance the "teatree" of the settlers, the *Leptospermum scoparium* of science. Sometimes the gum is found in small detached lumps, and at other times large deposits will be found in one spot. On cultivated land it is not unfrequently turned up by the plough, and in many places the cutting of drains in swamps has revealed large deposits of this vegetable product. It is also not unfrequently found in the forest; but, as the kauri trees, and nearly all the New Zealand trees, do not send out large tap-roots, but immense numbers of large surface-roots, the difficulty of finding and digging kauri gum on forest-covered lands is proportionately increased.

In the forks of the large branches deposits varying from a few pounds to nearly a hundredweight are sometimes found. When a kauri tree is cut in the bark, even the largest and oldest of them, varying in diameter from 6 to 10 or 12 feet, it will bleed like a young sapling. In a few weeks, if the weather be dry, a large mass of half-dried gum will have oozed from the wound, not unfrequently appearing in the form of a great, thick band, reaching from the wound to the surface of the soil around the tree. When a tree is felled the stump bleeds in a like manner, until large masses of gum can be broken off from the stump. This "young" gum is white in colour, and has not the rich amber colour which age imparts to it when stored beneath the surface of the soil, away from the action of the sun and weather.

The gum is not soluble in water. It ignites freely and burns with a lively sooty flame. It froths and bubbles, and produces a pleasant aromatic odour. The perfume it exhales when burning in the open air is not unlike that of frankincense and myrrh.

Though kauri gum and other varnish resins are usually cleaned before shipping, they are subjected to a second cleaning on reaching the varnish factory. For this work boys are usually employed. They use a long narrow hatchet, with a blade at one end and a hammer-head at the other. Irregular lumps are broken up by using the hammer end, and then a free use of the blade chips off every inferior part. In this latter operation the hatchet is handled like a chisel. The chips and gum-dust form the body of a cheap varnish. The cleaned gums are carefully graded according to kind, purity, and hardness, in order to secure homogeneity and uniform quality.

Besides kauri or other gum, turpentine and linseed-oil are necessary ingredients of varnish. The turpentine is received at the factories in barrels, where it is stored in tanks ready for use without further treatment. The preparation of the oil, however, is a very important matter. Upon it depend largely the drying properties, as well as the elasticity, toughness, and clearness of the varnish. The raw oil received at the factories is not of uniform grade, and hence arise many difficulties of treatment. Adulteration may or may not have been resorted to. Each lot of seed has its own peculiarities. To secure the best results in manufacture the linseed must be sown, grown, and harvested under the most favourable circumstances, care being had to its perfect maturity. A crop containing an undue percentage of other seed, or cut too soon or too late, or after an unfavourable season, will never yield an oil suitable for the finest grades of varnish. The oil is manufactured by simply crushing the seed and expressing the oil by hydraulic pressure. On its reception at the varnish factories the oil is pumped into tanks connected by pipes with boiling-pots. After boiling it is poured into iron vats, and subsequently pumped into other tanks, where it is allowed to settle and brighten, which requires from one to six months. When any is required for mixing with melted gum it is drawn off from the top. In order to accomplish the various results aimed at in varnishing, a different kind and quantity of dryer is mixed with each boiling.

In making varnish a copper kettle, containing a quantity of gum, covered with a sheet-iron lid, having a hole in it for the exit of the dense and noxious fumes, is placed over a hot fire. When the gum is melted throughout, the kettle is withdrawn and prepared oil is poured upon the gum, the proportions of each being in accordance with the sort of varnish desired. The contents are thoroughly mixed before the kettle is returned to the fire. The kettle being withdrawn again, and the temperature of the boiling oil and gum having fallen, turpentine is added to the mixture. All that then remains to be done is to filter the mixture through coarse muslin and pump it into tanks to settle and ripen at a temperature not less than 70° Fahr. From four to twelve months, and even longer time, is necessary to ripen the finer grades of varnish. During this process tanks of varnish are subjected to frequent tests by painters, who try each kind upon the surfaces, and under the circumstances it is expected to be used by purchasers. So whimsical a thing does even the best varnish often prove, that painters have a big vocabulary of opprobrious epithets by which they term its many, so-called, "deviltries." Among the various species of these "deviltries" are the "cracking," "blotching," "crawling," "sweating," "blistering," "specky," "peeling," &c. If the varnish was originally good its distemper may usually be removed by placing it in a clean, dry, warm, well-ventilated paint-shop. Painters, often forgetting this, return the barrel with the indorsement, "This contains a devil," and the varnish-maker, upon its receipt, mutters, "The devil's in the man." In truth, the judgment of neither is very clear upon the matter. Both may be half right. Some varnish-makers prepare paints also with a view to their producing a suitable surface for varnish, and thus obviate many of the "deviltries" arising from the ignorance or carelessness of painters.

As linseed-oil will before long be largely manufactured in New Zealand, the above remarks will show that the manufacture of varnish from kauri gum is not unlikely to prove a payable industry.

Some of the finer species of kauri gum are used in the manufacture of jewellery; but, while the gum is very clear and beautiful, it is not so desirable for this purpose as amber. It is nothing like as hard as the latter, and is much more brittle.

The original amber forests seem to have extended over a vast stretch of country. They are said to have reached from Holland over the German coast, through Siberia and Kamschatka, even to North America. Professor Zaddack, of Königsberg, is of the opinion that the trees yielding the amber resin must have grown upon the greensand beds of the Cretaceous formations, which at the time formed the shores of estuaries, where the lower division of the Tertiary formation accumulated. Immediately over the amber-producing strata rest the brown-coal beds, the fossil plants found in which differ entirely from the amber-bed flora.

The Maoris, notwithstanding the scarcity and antiquity of amber, will not be persuaded that it is any more beautiful than a fine specimen of kauri gum. It is questionable, however, whether the ornaments made from the latter will ever become an article of commerce.

When first engaged in preparing this paper on kauri gum I anticipated little difficulty in making myself familiar with the interesting facts connected with the subject; but, after consulting various public and private libraries, I was surprised to find how very little had been written about kauri gum. I had access to many publications upon New Zealand, but in no one could I find the desired information, although many of these works are written by authors distinguished for their love of research, and for their superior ability and scholarship. Since I could learn little of kauri gum from these sources, I have been obliged to depend for information mainly upon my own observations, and upon such facts as I could gather in conversations with old residents, and with those engaged in this industry. Kauri gum was known to the Native race long before the Islands were settled by Europeans. They used it for the purpose of kindling their fires; and it is also said to have been employed in their religious rites, but there does not appear to be any ground for the statement. It became an article of commerce soon after New Zealand was settled as a British colony. The first person who engaged in this export was Mr. Busby, of the Bay of Islands, and this venture proved a commercial failure. At first the exports were small, amounting to about 100 tons per annum. The price of gum at that time ranged from £5, or $24, to £6, or $28 80c., per ton. The Natives then were the only persons engaged in searching for it and bringing it to market. The implements used in digging for the gum consist of a spade and a spear. The spear is a long steel rod about half an inch in diameter, with a wooden handle with a cross on the top like that of a spade or a shovel. The rod is brought to a point, and the gumdigger pierces it into the ground. Practice and experience enable him to tell whether he is touching a stone or a piece of gum. When he touches the gum he digs around it until it is extricated, and then renews the search as before. The number of persons engaged in digging gum varies from 1,600 to 2,000, of whom a great many are Maoris. Europeans have resorted to this kind of work; but they belong generally to a class who are unruly and impatient of the restraints which a civilized life imposes upon them, and who prefer to camp out, and live in tents and raupo (a long grass) huts. The gumdigger generally camps upon unsold Crown or Native lands, where he can pursue his occupation without being disturbed. Each man takes his chance and works when he likes. Sometimes he may earn as much as 12s., or $2 88c., to 16s., or $3 84c., per day; but his average earnings do not exceed £1, or $4 80c., to £1 5s., or $6, per week. His remuneration, of course, depends upon the quantity and quality of the gum he is fortunate enough to get, which in his case depends as much upon chance or luck as upon the amount of skill or diligence he may bring to bear upon his occupation. The gumdigger seldom, if ever, takes care of his earnings. The money he gets is generally expended at the nearest tavern in having what he calls a "jolly good spree." It is generally supposed that a European who resorts to gum-digging is unfitted for any other occupation. He leads a reckless, dare-devil sort of life, away from friends and kindred, and from the restraints of civilization. All the finer feelings of his nature become blunted, and he falls to a lower depth than the savages with whom he makes his home. The gum on being taken out of the ground is covered with earth, and its surface is found to be in a partial state of decay. When the digger is tired of work he carries his find of gum in a bag to his tent or hut, and in the evening or upon rainy days he scrapes off the decayed surface until the clear solid gum beneath is reached. When a sufficient quantity has been scraped, it is taken to the nearest shop or publichouse, where it is sold for what it will bring. Sometimes the purchaser will assort it; but it is not generally sorted till it reaches the city buyer, who employs skilled hands for that purpose. The gum, after it is scraped and assorted, is packed carefully in boxes, so as to prevent the lumps from breaking. It is then ready for export. The dust and scrapings are also exported. Some of the gum is used in New Zealand for the manufacture of a kind of varnish, but in no great quantity. The price of gum varies according to the quality and the condition of the market. It ranges from £43, or $206 40c., to £56, or $268 80c., per ton. The average price may be safely set down at £46, or $220 80c., per ton. At this rate the total value of the shipment for the year 1882, namely, 5,230 tons, was £240,580, or $1,154,784.

More than two-thirds of the gum goes to the United States. It is shipped to either New York or Boston in sailing-vessels, or to London for transhipment to the American cities. The merchants here, in sending gum to the United States, usually ship it in vessels that have been chartered in New York for the round trip. The agent to whom the vessel is consigned loads with gum, which he has previously prepared for export, and he will not take freight for any one else so long as he has gum enough to load his vessel. The cost of freight upon gum from Auckland to London is usually from £2 8s., or $11 52c., to £3, or $14 40c., per ton.

The question is often asked in New Zealand if kauri gum will not soon become exhausted, and the question may be answered in the affirmative.

The kauri pine, from which the kauri gum is obtained, is a most useful tree. The wood is very hard, and is susceptible of a beautiful polish. It is extensively used in house-building and in the manufacture of furniture. It also makes excellent masts and spars for ships. The trees grow to a height of 150 to 200 feet. There is a fine old kauri within twenty-five miles of Auckland which measures 203 feet in height and 61 feet in circumference. A curious fact may here be mentioned in connection with the kauri pine, and that is, it is the only pine of New Zealand bearing a cone: the other pines, such as the totara, kahikatea, and other species of *Podocarpus* and *Dacrydium*, produce berries.

It is a matter of regret that the kauri forests are disappearing. The trees are being so rapidly cut down that they will soon cease to exist. The Government has not as yet taken efficient steps to protect them, either by conserving those that remain or by planting new ones. At the present rate of consumption, fifty years will see the great bulk of the kauri-trees cut down. Of course, when the trees are destroyed there can be no fresh deposits, and kauri gum will become a thing of the past.

Some idea of the yield of the gum fields can be formed from the following table, showing the number of tons exported from the year 1871 to 1882, inclusive:—

|  | Tons. |  | Tons. |
|---|---|---|---|
| 1871 | 5,053 | 1878 | 3,445 |
| 1872 | 4,811 | 1879 | 3,228 |
| 1873 | 2,833 | 1880 | 4,725 |
| 1874 | 2,568 | 1881 | 5,461 |
| 1875 | 3,230 | 1882 | 5,533 |
| 1876 | 2,888 |  |  |
| 1877 | 3,632 |  | 47,407 |

The amount of gum taken out of the soil up to the present time has been so great that it is computed it would require a forest growth of ten thousand years to replace it.

## NEW ZEALAND FUNGUS.

Amongst the various articles of export peculiar to the North Island of New Zealand is that of fungus. It is only within the last few years that public attention was directed to it. It was not deemed of sufficient importance to be included in the list of colonial exports until 1872, and during that year about 58 tons were shipped from Auckland, the value of which was £1,927, or $9,250. In 1877 the shipment increased to 220 tons, the value of which was £11,318, or $54,326. In 1882 the number of tons was 400, and the value £18,930, or $90,864.

I give below a table showing the quantity and value of fungus exported from the Colony of New Zealand for each year from 1872 to 1882, inclusive:—

| Year. | Tons. | Value. | |
|---|---|---|---|
| | | £ | $ |
| 1872 ... ... ... | 58 | 1,927 | 9,250 |
| 1873 ... ... ... | 95 | 1,195 | 4,736 |
| 1874 ... ... ... | 118 | 6,226 | 29,885 |
| 1875 ... ... ... | 112 | 5,740 | 27,552 |
| 1876 ... ... ... | 132 | 6,224 | 29,875 |
| 1877 ... ... ... | 220 | 11,318 | 54,326 |
| 1878 ... ... ... | 173 | 8,652 | 41,530 |
| 1879 ... ... ... | 59 | 2,142 | 10,282 |
| 1880 ... ... ... | 165 | 6,227 | 29,890 |
| 1881 ... ... ... | 202 | 9,735 | 46,728 |
| 1882 ... ... ... | 400 | 18,939 | 90,907 |

Very few people know what fungus really is. The word itself is a generic term, and is applied to a large natural order of cryptogamic plants, comprehending mushrooms, toadstools, and, indeed, all the microscopic plants which form mould, mildew, &c. Amongst the many thousand species known to science very few of them are of any value as food. Professor Thomas Kirk, of Canterbury, in a paper recently read before the Philosophical Society of Wellington, New Zealand, draws attention to the fact that fungus, in several striking characteristics, bears relation to plants similar to that borne by insects to other animals. He says a larger number of plants is included in Fungi, regarded as a single order, than in any other group. The largest number of animals is comprised under Insecta. Each group exhibits a large amount of polymorphism and parasitism. Each contains many species injurious to man, and but few from which he derives direct benefit. While other large groups of animals and plants are constantly yielding additions to the catalogue of organic substances directly or indirectly utilized by man, fungi and insecta, notwithstanding their vast numbers, but rarely assist to swell the roll. Professor Kirk admits, however, that this opinion is at variance with the comparative estimates of the number of species comprised under different orders as stated in botanical text-books, but says it is warranted by the known results in countries where fungi have been investigated with some approach to completeness. He says, "In Great Britain over 3,000 species of fungi are known, considerably more than twice the number of phænogams and filicales put together." Some botanists contend that the truth is, not that the greater number are poisonous and only a few edible, but that the noxious species are comparatively few, the principal danger arising from the similarity of some of the poisonous and some of the edible species which acquire poisonous properties in particular situations. This is notably true in certain kinds of mushrooms, which become poisonous on account of the situation in which they are grown; but as a rule this theory is applicable only to a few varieties of fungi. A curious fact about the growth of fungi is that they are perfect plants, growing from and reproducing bodies analogous to seed. It has been clearly demonstrated that fungi are of cellular growth, that they form no woody fibre like flowering plants, and that they do not form chlorophyl in their tissues. The people of ancient Rome for many years imported various species of fungi for food, besides consuming quantities grown at home. It is said that the United States produce a greater number of species of edible fungi than any other country in the world, but there does not appear to be any evidence that the people there care especially for them as an article of food. The French and the Swedes, on the contrary, display great fondness for them, and pay exorbitant prices for certain varieties. Some scientists contend that the large fleshy growths found in the woods or on trees belong properly to the reproduction and not to the vegetation of these plants. It is said that they are disproportionately large compared with the mycelium, and consist of a main stem called a stipe, and an expanded top called a pileus, on which these spores are borne in various ways. The mycelium is sometimes reduced to a mere trace of evanescent flocose growth, while the reproductive body becomes a fleshy mass, several pounds in weight. But the spores are always minute, being sometimes only $\frac{20}{1000}$ of an inch in diameter.

It appears that the export of New Zealand fungus is confined to but one species namely, *Hirneola polytricha*, although there are some very rare varieties, bearing a close resemblance to it, found in the neighbourhood of Christchurch and Wellington, specimens of which were sent to the Vienna Exhibition under the name of Jew's-ear fungus (*Hirneola auricula judæ*). These specimens may be easily distinguished from the *Hirneola polytricha* by the colour. The Jew's-ear fungus is of a pinkish tint, while the *Hirneola polytricha* is of a greyish colour. The former variety is so seldom met with that it is not at all likely that it will ever become an article of commerce. The inside of the leaf of the *Hirneola polytricha* when dried is a bright reddish brown, while the outside presents a glossy dove colour. The leaf is shaped exactly like a saucer, and varies in size from 4 to 7 inches in diameter. It is flabby in appearance, rough to the touch, and of considerable strength. It is not readily soluble in water, but is said to dissolve easily with the addition of an alkali. It has been suggested as a substitute for isinglass in the manufacture of beer. Botanists have little difficulty in distinguishing the different varieties of these plants, notwithstanding their vast number. Indeed, it is claimed that each variety can be told unmistakably by the odour alone. Another peculiarity of these plants is their marvellous growth. They develop themselves more rapidly than any other species of plants in the whole range of the vegetable kingdom. They spring up by thousands in a single night. They are not produced by seed, but by a spawn which bears organs of fructification. Unlike other plants they do not absorb carbonic acid from the air and give out oxygen, but, like animals, absorb oxygen and give out carbonic acid, so that some naturalists have proposed to constitute for them a distinct kingdom of nature intermediate between the animal and vegetable.

The New Zealand fungus known to commerce is found upon various kinds of decayed timber in the North Island, in what are called new bush settlements. It favours damp localities, and is very plentiful on the East Coast, south of the East Cape. It exists, however, in the greatest abundance in the District of Taranaki. This district is about eighty miles long and seventy miles broad. It is bounded on the north by the Mokau River, on the west and south by the sea, and on the east by a straight line from the mouth of the Patea River to a bend in the Wanganui River, and by another straight line connecting the latter river with the source of the Mokau River. Within this region are vast forests: indeed, not more than one-tenth of the entire district is composed of open land. The process of clearing the ground is very slow: the settlers cut down the trees and pass a fire through them, the logs remaining unconsumed upon the ground, and, as they are not removed, the logs soon begin to decay. It is supposed that the growth of fungus is favoured if the trees after being felled and burnt do not touch the ground. It is more probable, however, that some peculiarity of the climate has more to do with its growth than anything else. It requires very little trouble and no expense to prepare this valuable article of commerce for the market. Indeed, the only thing necessary to do is to gather it, and spread it out in the open air or under sheds to dry. I know a number of children who keep themselves in pocket-money by collecting it, and they have no difficulty in telling it from noxious and poisonous plants of similar growth. Very few men, except those of idle and dissipated habits, engage in the employment of collecting fungus, unless I except the Maoris, who do not consider that occupation beneath their dignity. The fungus collected by the Natives is generally dried in smoky huts, and is, on that account, nothing like as valuable as that prepared by the children of Europeans. As soon as it is dried it is put in flax-baskets or jute-bags, and sold to the dealer. It is then packed in bales and shipped to China by way of Sydney or San Francisco. Some of it goes direct to San Francisco, where it is either transhipped to Hongkong or consumed by the Chinese population of our Pacific Coast. At one time the profit upon fungus was something enormous, and it could be bought from the collectors at little more than ½d. or 1 cent per pound, and sold in San Francisco at 7½d. or 15 cents per pound, and 11½d. or 23 cents in Hongkong. Now that its market value has become better known, it is difficult to purchase it here, even in small lots, from the collectors for less than 4d., or 8 cents, to 5d., or 10 cents, per pound. It loses rapidly in weight by shrinkage.

In 1873 the Government of New Zealand caused an inquiry to be made as to the purpose for which fungus is used in China, and the Colonial Secretary at Hongkong stated in one of his communications that the article was much prized by the Chinese community as a medicine, administered in the shape of a decoction, to purify the blood, and was also used on fast days with a mixture of vermicelli and bean-curd, instead of animal food. It is also said to be used in China and Japan for making a valuable dye for silks. Since this correspondence it has been discovered that it is used by the Chinese principally as an article of food. It forms the chief ingredient of their favourite soup, for which dish it is much prized on account of its gelatinous properties and its rich and delicious flavour. I send to the Department of State samples of fungus kindly furnished me by H. B. Morton, Esq., for examination and experiment. Mr. T. F. Cheeseman, the Curator of the Auckland Museum, is of the opinion that the fragment of wood attached to one of the specimens is from a tree known to the Maoris as whauwhaupaku, or to botanists as *Panax arboreum*. The other specimens were found on the karaka tree (*Corynocarpus lævigatus*) or the mahoe (*Melicytus ramiflorus*), kaiwhiria (*Hedycarya dentata*), pukapuka (*Brachyglottis repanda*), and the *Panax arboreum* already mentioned, as well as on several other soft-wooded trees. Fungus appears to have a slightly pungent taste, although it is generally said to be tasteless. I made soup out of some of the samples furnished me, but am not able to judge of its excellence as an article of food for civilized people; one of my Chinese neighbours, however, who happened to be passing my door while the soup was boiling, caught the aroma of it, and very kindly relieved me of any further trouble in trying to cultivate a taste for one of his favourite national dishes.

## NEW ZEALAND FLAX.

New Zealand flax (*Phormium tenax*) is by far the most valuable fibrous plant indigenous to this colony. It has been an article of export ever since 1809. The attention of Europeans was first directed to it by the great navigator Captain Cook, who described it as something superior to either flax or hemp. The Maoris have for many years used it for binding together the framework of their houses, and for making clothing, baskets, mats, fishing nets and lines, and sails for their boats and canoes. The name *Phormium tenax* is derived from the Greek word *phormos* (a basket), and *tenax* (strong). It belongs to the liliaceous family of plants, a species of plants whose history can be traced from the earliest ages.

*Phormium tenax* is sometimes called the flax lily. The leaf varies in size from 3 to 14 feet in length, and from ½ inch to 5 inches in breadth at the widest part. It grows in bunches or groups of plants; each shoot has five leaves. On an average about ten of these shoots form a bunch. The leaves are perennial, hard, and sword-shaped, with a stalk rising 5 or 6 feet above them bearing a profusion of yellow and sometimes red flowers, followed by triangular seed-vessels filled with flat and thin black shining seed. The plant attains its full growth in three years, when the leaves generally split at the end, and it first comes into flower. It is said that in rich soil the flower-stalk rises to a height of 20 feet. The leaves are smaller in structure than those of European flax and hemp plants, being composed of cellular trusses running the whole length of the leaf, incased in a green substance. The trusses consist of two parts, wood and bast, the latter forming the fibre so highly prized. The fibro-vascular bundles compose the inner bark of the plant, and serve to circulate the juices which are taken from the soil by the roots. They consist of exceedingly fine threads, one lapping over the other in such a manner as to give a free circulation throughout the leaf. The plant is indigenous to New Zealand and Norfolk Island, although it has been transplanted in India and other countries, and it is said will grow on the Pacific Slope of the United States. It grows best in rich, moist, and well-drained ground. It reaches the greatest size on the banks of running streams.

When the leaves are full grown the Natives gather them green and separate the fibres. The Maoris produce about 1 ton of fibre out of 4½ tons of green leaves. A full-grown plant will produce on an average about thirty-six leaves, and it takes about six leaves to yield 1 ounce of fibre. At this estimate an acre of ground, planted 3 feet apart, would yield about 16 cwt. of fibre. When cultivated the yield is about 2½ tons per acre.

The list of names of the different varieties of *Phormium tenax* distinguished by the Natives is a very long one. It embraces *aonga*, a variegated flax described by Bishop Selwyn; *atewhiki*, a very white fibre used for making fine mats and garments—the leaf is narrow with a reddish tinge, edge and keel narrow, bright-scarlet lines; *tapoto*, cultivated at Coromandel, Kawhia, and Waikato—glossy leaves, rather red at the edge, has a general orange-green appearance at a distance.

Two varieties of *Phormium tenax* are described in the New Zealand flora. Dr. Hochstetter makes the following classification: *Tihore*, a cultivated kind; *tuhari*, swamp flax; and *wharariki*, hill flax. The first-named, *tihore*, is regarded as the best variety; it is used only for the finest work by the Maoris; it seldom grows to a greater height than 5 feet. *Tuhara*, or swamp flax, grows to a height of from 10 to 14 feet; it bears a red flower about half an inch longer than the *tihore*; the seed-pods are also larger, and the scape is of a dark-red colour. This flax may be distinguished from the other species by its bright colour, sturdiness, and the nature of its fibre. *Wharariki*, or hill flax, is said to possess but a small proportion of fibre, and that of a very coarse kind. It is said to be cultivated in the coldest parts of the South Island, but it does not appear to be used for manufacturing purposes.

The greatest difficulty in the preparation of the fibre of *Phormium tenax* is to do away with the gummy or mucilaginous products found in the leaf. What is ordinarily spoken of as the gum is, in reality, at least three different products, viz.: First, the gum on the outside of the lower part of the leaf; second, the bitter principle and mucilage contained in the cells of the leaf; third, the cement that binds the ultimate fibres together into bundles. Captain Hutton found, while experimenting, that the gum softens but does not dissolve in cold water, and that it really dissolves in boiling water. The bitter principle is easily overcome by cold water. The cement dissolves in boiling water, and more quickly in alkalies. Acids which dissolve the gum have no effect upon the cement. He says: "The strength of the fibrous bundles depends entirely upon the cement that holds the ultimate fibres together; and if this is dissolved either by hot water or alkali the whole would separate into a mass of fluff, with no coherence or strength." It appears, from a report on the chemistry of *Phormium tenax*, by Professor A. H. Church, that the fibre contains much matter soluble in water or liable to change. This accounts for the decay of rope made with this fibre. Professor Church says that the use of a mixture of lubricating or machinery paraffine oil with wood-tar seems to prevent the entrance of sea-water and the proneness to change in phormium fibre. He suggests that the fibre should be immersed in sulphuric acid of the consistency of that used in the manufacture of vegetable parchment for the purpose of toughening and strengthening it. He is opposed to the use of alkaline matters at a high temperature in the treatment of the fibre, from the fact that they tend to destroy the oil and otherwise injure the fibre. He does not think that the ultimate fibres are held together by any cement, but by their cell walls.

New Zealand flax was generally supposed to be the strongest fibre in the world, but such is not the case. Recent experiments with testing machines show that, while it is more than double the strength of ordinary hemp and flax, it is not as strong as silk. I give below a table furnished me by Mr. T. F. Cheeseman, of the Auckland Institute, showing the comparative strength of various kinds of fibres:—

| | lb. |
|---|---|
| Silk will bear a strain of ... ... ... | 34 |
| *Phormium tenax*, a strain of ... ... ... | 23 7/10 |
| Russian hemp, a strain of ... ... ... | 16¾ |
| Common flax, a strain of ... ... ... | 11¾ |
| *Agave americana*, a strain of ... ... ... | 7 |

This table does not vary much from that given by Professor Lindley, which is as follows:—

| | lb. |
|---|---|
| Silk will bear a strain of ... ... ... | 34 |
| *Phormium tenax*, a strain of ... ... ... | 23 |
| European hemp, a strain of ... ... ... | 16 |
| European flax, a strain of ... ... ... | 11 |

In 1837 the export from New Zealand was 1,062 tons, the value of which was £22,125, or $106,200. In 1864 the export increased to 2,228 tons, with a value of £63,114, or $302,947. The largest export occurred in the year 1873, when the quantity was 6,454 tons, and the value £143,799, or $690,235. I give below a table showing the quantity and value of flax exported from New Zealand for each year from 1869 to 1882, inclusive:—

| Years. | Quantity. | Value. | |
|---|---|---|---|
| | Tons. | £ | $ |
| 1869 ... ... ... ... | 2,028 | 45,245 | 217,176 |
| 1870 ... ... ... ... | 5,470 | 132,578 | 636,374 |
| 1871 ... ... ... ... | 4,248 | 90,611 | 434,932 |
| 1872 ... ... ... ... | 3,987 | 99,405 | 477,144 |
| 1873 ... ... ... ... | 6,454 | 143,799 | 690,235 |

QUANTITY AND VALUE OF FLAX EXPORTED—*continued.*

| Year. | Quantity. | Value. | |
|---|---|---|---|
| | Tons. | £ | $ |
| 1874 ... ... ... ... | 2,039 | 37,690 | 180,912 |
| 1875 ... ... ... ... | 639 | 11,742 | 56,361 |
| 1876 ... ... ... ... | 897 | 18,285 | 87,768 |
| 1877 ... ... ... ... | 1,053 | 18,826 | 90,364 |
| 1878 ... ... ... ... | 623 | 10,666 | 51,196 |
| 1879 ... ... ... ... | 445 | 7,874 | 37,795 |
| 1880 ... ... ... ... | 894 | 15,617 | 74,961 |
| 1881 ... ... ... ... | 1,307 | 26,285 | 126,168 |
| 1882 ... ... ... ... | 2,040 | 41,955 | 201,384 |

It will be seen that in the year 1882 the returns indicate a more prosperous condition of the flax-mills than the colony has enjoyed since 1873.

I learn from the Juror Commissioners' report on flax that the green leaves are stripped by revolving rollers with projecting beaters travelling at a high rate of speed, which crush the epidermis against a fixed plate, so set as to allow room for the fibre to remain intact. The fibre, thus freed from the leaf of the plant, is washed by various methods, put on the ground or on lines to dry and bleach, finished by an arm or barrel scutch, and, when baled, is ready for market.

All the machines used are identical in principle, and vary only in the details by which the principle is carried out. This principle is that the leaf is held between horizontal feed-rollers, revolving at a certain speed, while, as the leaf passes out from them, a drum armed in its circumference with iron beaters, and revolving more rapidly than the feed-rollers, strips the epidermis and tissues away from the fibre, means being provided for adjusting the beating drum to a proper distance from the roller or bar against which the phormium leaf is stripped, so that the leaf may neither, on the one hand, pass through without being crushed, nor, on the other, have the fibres cut.

The method of preparing the fibre by machinery is certainly a great improvement over that of the Maoris, because the waste is nothing like so great. Indeed, the Maoris do not obtain from each leaf one-fourth of the quantity that would be secured in machine-dressing. They cut off the leaf about 6 inches below the point where the two blades adhere together, and reject the coloured edges; they also take much time and pains in preparing the leaf, often soaking it four or five days in running water, and then beat it with a stone or mallet. This process is repeated over and over again for four or five weeks. They cannot be made to understand the value of time. It is certain, however, that the fibre dressed by the Natives is far more valuable and beautiful than that prepared by machinery.

*Phormium tenax*, I learn, is now being cultivated extensively in the Azores Islands. A company has been established there, composed of two Englishmen and two Portuguese. One of the latter is stated to be the holder of a concession from the Government of a monopoly for the manufacture of this article throughout Portugal and all Portuguese possessions.

It is more than probable that the cultivation of *Phormium tenax* in New Zealand will soon become a profitable industry. The rapid spread of colonization and the alienation of the waste lands of the Crown to private proprietors have very much narrowed the source of supply of wild flax, which principally grows most luxuriantly in soil that is selected by the settlers for agricultural purposes. Of course, as the stock of wild flax becomes scarce, the necessity for cultivating the plant is greater. Experience proves that the wild flax will soon become insufficient for the demand, and due consideration must be given to the fact that flax, like nearly all other plants, can be improved by cultivation.

## THE RABBITSKIN TRADE OF NEW ZEALAND.

The increase in the quantity and value of rabbitskins exported from New Zealand within the last few years has been so great as to appear startling. Unfortunately, however, it is one of those industries which, strange as it may appear, the people do not wish to see prosper, or at least prosper for any great length of time. The damage done to the sheep-runs by the little animals that furnish the skins for export has been of such magnitude as to become the subject of parliamentary legislation. When the great navigator Captain Cook first visited New Zealand the only land mammals found to be indigenous in the Islands were two varieties of the rat and one of the common bat. Some naturalists, however, contend that the rat was not found here, but this view does not appear to be supported by any direct evidence. About twenty years ago there was probably not a single rabbit throughout the length and breadth of New Zealand, save, perhaps, a few domesticated pets.

According to the Customs returns there were exported from the colony, in the year 1882, 9,198,837 skins, of the value of £88,725, or $425,880.

The questionable honour of turning loose the first rabbits in the southern part of the colony appears to belong to Dr. Menzies, of Southland, who liberated a few pairs of the common grey kind on some sand mounds in the neighbourhood of Riverton, Southland. This was done, it is said, amid a certain amount of ceremony, a banquet being given and a number of speeches made to celebrate the event. Sport was scarce, and other rabbits, including some silver-greys, were liberated. These multiplied so fast that people did not have to wait long for that kind of sport. They increased rapidly, and the destruction wrought by them was of such a character that in a few years it became a question whether the colonists, with their flocks and herds, should vacate the country, or whether a systematic effort should be made to exterminate the pests. Whole tracts of country became denuded of vegetation. Sheep were dying by hundreds of starvation. One hill station on Lake Wakatipu, which maintained 50,000 sheep, was, in a short time, so deprived of vegetation that it could not support 6,000. The property destroyed by the rabbits is estimated by millions. One sheep-farmer only got 900 lambs from 6,000 ewes; another, 2,500 from 20,000; a third, only 700 from 10,000; and a fourth had no increase at all.

The rabbit begins breeding at four months old; and in New Zealand, where the climate is mild, the trees evergreen, and where the grass grows all the year round, it continues to breed throughout the year. But, supposing that a pair of rabbits do not breed oftener in this climate than in England, which is seven times a year, and that they only bring forth eight young at a time, they would multiply in the course of four years to the number of a million and a quarter.

Various efforts were adopted for the purpose of destroying these pests. Different kinds of traps were used, but only with indifferent success. The next plan was to hunt them down with dogs, and to shoot and hunt them on the edges of bushes and in broken land. This plan, although an excellent one, is not regarded with as much favour as that of poisoning them. Hundreds of men and dogs are now employed in hunting rabbits. Upon a farm in Canterbury 150 men were employed, and it was estimated that the cost to the owner was about 2d., or 4 cents, for every rabbitskin obtained by the men.

Mr. Douglas, who acted as Inspector in the West Oreti Rabbit District, which comprised about 1,200,000 acres of occupied land, and about the same quantity of unoccupied Crown land, much of which consisted of densely-timbered country, or mountain tops with narrow valleys, was able to keep the rabbits down in the low-lying country, but found that they were constantly getting a firmer hold of the riverbanks and timbered or rough broken lands, and that they gradually worked their way northward. Many sheep-farmers in this district suffered to such an extent that they had to give up their homes and seek other employments.

Although the Legislature passed stringent laws for the purpose of overcoming the rabbit pest, little progress was made toward abating it until the method of poisoning the rabbits with grain soaked in water to which phosphorus had been added was adopted. The rabbit nuisance now appears to be under control. There are, however, some serious objections to the use of poisoned grain. For instance, sheep are often killed with it. After rabbits are lessened by the poison, in some parts it is customary to turn loose ferrets.

The occupation of killing rabbits in New Zealand has become a profitable one. A good rabbiter can easily earn from 12s. 6d., or $3, to 16s. 8d., or $4, per day, and it is said he is decidedly opposed to their extermination, inasmuch as his occupation would thereby be lost. He may, perhaps, have a sort of reverence for them akin to that of the Hindoo for the snakes he is empowered to kill. It is probably not generally known that a few years ago the British Government in India was so struck with the loss of human life by snake-bites that it resolved to offer a reward for every snake killed. District officers were appointed to receive the snake-heads and to pay the fees thereon. For a time the system appeared to work well, but at last it was discovered that there was no abatement in the average annual loss of life from poisonous snakes, notwithstanding the vast number of heads that were delivered to the officers. An investigation was ordered, and it was found that the snakes killed by the natives were not obtained in the jungle, but were quietly and comfortably bred and reared for the occasion on the Hindoos' own premises. In New Zealand the colonists are beginning to feel that it is unwise to keep up an army of rabbiters, and have turned their serious attention to poison and the introduction of ferrets and other natural enemies of the rabbit.

The number of rabbitskins annually exported from New Zealand does not probably represent one-tenth part of those actually destroyed. The bush country is especially difficult to deal with. The poisoned grain has to be laid very often about the edges of the brush, and the rabbits, after eating it, generally retire to their holes, or into the bush, where they die, and cannot be found.

The amount of property destroyed by rabbits, and the vast sums of money expended in trying to get rid of them, to say nothing of the endless trouble, toil, and pains, should be a lesson to those who think no harm will come from the act of turning adrift in new countries foreign birds and animals. Indeed, many of the pests that afflict the Australian Colonies have been brought about by the misdirected efforts of acclimatization societies. While these societies did not introduce the rabbit, they brought here a large number of English hares, together with the house-sparrows, larks, linnets, and other hard-billed birds, and the result has been an almost irreparable loss to the country. Grapes, peaches, and plums in New Zealand suffer on account of the ravages made by these hard-billed birds. Wheat, oats, and barley are destroyed by them. It is found that these birds will not eat insects when they can procure fruit and seed. The English hares brought here have been very destructive, especially to the orchards and young plantations of forest and ornamental trees. In some of the orchards the bark around the trees, about a foot above the ground, had been eaten off by them.

The New Zealand rabbit is larger than the common rabbit of Europe and the United States. Its ears are long and sometimes exceed the head in length. In the South Island large numbers of them are of various colours, but generally of a brownish grey. Some are of a pure grey, and others of a silver-grey. The colour of the rabbit is believed to be a wise provision of nature, resembling somewhat the sombre colours of the woods and heath they frequent, whilst those inhabiting the snowy country become perfectly white. The rabbit is usually quiet during the day, and exhibits its activity in the evening. Its greatest characteristic is timidity. It will run at the slightest approach of danger. It does not, however, run continuously, but seeks safety by retreating to its burrows. It has no means of defence except the quickness of its hearing and the rapidity of its movements.

Immediately after death the rabbits are skinned, and the heads, feet, and all fat removed. The skins, if the weather is fine, are placed in the open air to dry, but if it rains they are hung up under sheds. When thoroughly dry they are taken down, and are tied in bundles, and packed in bales of suitable sizes. They are subjected to but little pressure. No chemicals whatever are used in preparing them for the market. A little carbolic-acid powder is used in packing.

Rabbitskins command a good price here, and, now that a market has been found for them in the United States, it is likely that the price will be still further advanced. The subjoined table shows the quantity and value of rabbitskins exported from New Zealand for each year from 1873 to 1882 inclusive:—

| Year. | Number. | Value. | |
|---|---|---|---|
| | | £ | $ |
| 1873 ... ... ... ... | 36,716 | 1,263 | 6,062 |
| 1874 ... ... ... ... | 56,504 | 1,878 | 9,014 |
| 1875 ... ... ... ... | 111,142 | 3,913 | 18,782 |
| 1876 ... ... ... ... | 311,632 | 4,418 | 21,206 |
| 1877 ... ... ... ... | 918,236 | 8,630 | 41,424 |
| 1878 ... ... ... ... | 3,951,209 | 33,460 | 160,608 |
| 1879 ... ... ... ... | 5,384,506 | 46,759 | 224,443 |
| 1880 ... ... ... ... | 7,505,616 | 66,976 | 321,485 |
| 1881 ... ... ... ... | 8,514,685 | 84,774 | 406,915 |
| 1882 ... ... ... ... | 9,198,837 | 88,725 | 425,880 |

It will be seen from the above table that the increase in the value of rabbitskins exported from New Zealand has been, during the last four or five years, far greater than the increase in the quantity—a fact owing to a market having been found for them in the United States, and the variety of uses to which these skins are now applied.

A small quantity of rabbitskins is consumed here in the manufacture of hats. Mr. Fenton, of Queen Street, Auckland, made some beautiful felt hats out of them. These hats are soft and pliable to the touch, and are becoming popular. When the fur is long it is sometimes cut in two, and the finer or inner portions mixed with wool. Various kinds of machines have been invented for the manufacture of hats out of rabbit-fur, some of which distribute the fur with marvellous rapidity and evenness on revolving metal cones, the size of felt cones used by the hatters. After the fur is scraped off, the skins are disposed of for the manufacture of glue and sizing.

Large numbers of rabbitskins are used in Germany and the United States for the manufacture of furs. In Hamburg they are said to be made to look like fine sable. In fact, the art of colouring rabbit-fur has reached such a high degree of perfection that it can be made to imitate almost every kind of fur.

## TANEKAHA BARK.*

Tanekaha bark is a product peculiar to New Zealand; it is found in no other country in the world. During the last few years considerable quantities of it have been exported to Europe, where it is highly prized on account of its superior dyeing and tanning properties. Recent tests have established the fact that it is one of the best vegetable dyes, especially for yellow, pink, and fawn colours. The tree producing the bark belongs to the genus Phyllocladus, comprising the trees known as the celery-leaved pines. It belongs to the same section of the coniferæ as the well-known yew of Europe and North America, although it differs widely from it in habit and appearance. Only five species of the genus Phyllocladus are known to exist. Three of these are peculiar to New Zealand, one is a native of Tasmania, and the other of Borneo. The New Zealand species are as follow: (1) The *Phyllocladus trichomanoides*, the tanekaha of the Maoris; (2) *Phyllocladus glauca*, or toatoa; (3) *Phyllocladus alpina*, or mountain tanekaha. The two species found outside of New Zealand are but little known, and are not applied to any economic purposes. The Tasmanian tree is the *Phyllocladus rhomboidalis*, and is plentiful in the hilly parts of that island, forming a tree about 40 or 50 feet in height. The species in Borneo is called *Phyllocladus hypophylla*. It rarely attains a greater height than 20 feet, and only grows on the mountains.

The tanekaha is a very handsome tree. It attains a height of 60 to 70 feet, and the trunk is from 2 to 3 feet in diameter. The timber from this tree is remarkable for its strength and durability. It is very close in the grain and is of a reddish-white colour. It is especially adapted for piles, sleepers, planking, &c. It is also used for spars and masts for small vessels, but is too heavy for large ones. The tree has a very peculiar appearance, and when once seen cannot be easily forgotten. It throws out its small thin branches with wonderful regularity, almost at right angles with the trunk. The foliage consists of coriaceous obovate toothed phyllodia, so nearly resembling leaves that they are often mistaken for them. In other words, the so-called leaves of the tanekaha tree, and indeed of all the adult species of the Phyllocladus, are composed of the flattened branchlets of the tree growing together. The true leaves are seen only on the seedling plants, and are linear and sharply pointed, but these soon drop off, and their places are taken by the flattened branchlets above referred to, which are expanded horizontally and are variously lobed. In some species the flowers grow from out of the phyllodia, showing that they are not simple bodies, but in such cases consist of leaves and stems combined. Inflorescence and flowers of the same nature as in Dacrydium, except that the flowers of this are often clustered together and sunk in fleshy peduncles. (See Hooker's Flora.)

The tanekaha tree is a common one in New Zealand, and is scattered all through the North Island as far south as Lake Taupo, in latitude 39° south, and thence more sparingly to Cook Strait, attaining its southern limit in the District of Nelson. An interesting fact connected with this tree is that it will make beautiful walking-sticks. The method pursued by bushmen is to bruise the bark of the sapling at regular intervals, and after a few days cut the sapling down and peel off the bark; the stick then presents a beautiful mottled surface, altogether unique and of a bright red-and-white colour, which will always remain. The peculiar colour of the wood and the frequency of the knots, caused by the growth of the numerous branches and the large percentage of tannin contained in the bark, help to form distinguishing and varied characteristics.

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* **My thanks are due to Mr. T. F. Cheeseman, F.L.S., of the Auckland Institute, for his valuable aid in the preparation of this paper.**

The bark of the tanekaha has a smooth surface and is of a brownish-grey colour, something like the hickory of North America, but is not so smooth and glossy. My attention was first directed to the tanekaha bark in the autumn of 1882, when I found a large quantity of it lying on one of the wharves in Auckland awaiting shipment. Upon inquiry I learned that it has been an article of export in limited quantities for many years. I at once addressed a letter to Dr. James Hector, of the Colonial Museum at Wellington, with the view of acquiring such information as he might possess in regard to it. Dr. Hector informed me that the bark was a very valuable dye-stuff, but that the tree was rarely met with in the South Island. He said, however, that, if I would send him a sample of the bark grown in the District of Auckland, he would forward me an analysis of it. A sample was procured, and its receipt was acknowledged in the following report from Mr. Skey, the Government Analyst:—

New Zealand Geological Survey Laboratory,
Wellington, 8th June, 1883.

Result of analysis of Specimen No. 3498, forwarded by G. W. Griffin, United States Consul, at Auckland. Received 30th May, 1883. The dry bark contains 28·66 per cent. of tanning matters, principally catechuic and allied acids, tannic acids forming the remaining portions. It is a good dyeing bark for yellow, pink, and fawn colours, and is held in high esteem in commerce as a fast dye.

W. Skey.

I was surprised at the large amount of tannin contained in the bark, and decided to prepare a report upon it for the Department of State, that the information might be communicated to the leather and glove manufacturers in the United States.

Mr. Edgar, of Auckland, who is practically acquainted with the uses of tanekaha bark as a dye, states it is especially suitable for colouring basils (a leather made of sheep skins). Mr. Edgar, however, says that it is very difficult to prepare the bark for a dye-stuff here, as it has to be rasped before it can be used, and no machinery has been employed for that purpose in the colony. The bark is also said to have no superior as an organic mordant. The astringents classed as organic mordants are preferred to other astringents, because the tannin which they contain is accompanied by very little colouring matter. Tannin, when pure, consists of a whitish powder, dissolves readily in water, and has a sharp astringent taste.

In 1873 an analysis of some of the barks of New Zealand was made at the instance of Sir Julius Vogel. They were tested against those imported into the colony for tanning purposes from Victoria and South Australia. The subjoined table shows the quantity of tannin in the several barks operated upon:—

| Nature of Bark. | Percentage of Water as received. | Percentage of Tannin. | |
|---|---|---|---|
| | | In Normal Bark. | In Dry Bark. |
| Black birch (*Fagus fusca*) ... ... | 10·59 | 6·9 | 7·62 |
| Rimu (*Dacrydium cupressinum*) ... | 11·21 | 3·8 | 4·31 |
| Rata (*Metrosideros robustus*) ... | 15·87 | 15·2 | 18·56 |
| Hinau (*Elæocarpus dentatus*) ... | 12·15 | 19·12 | 21·78 |
| Black wattle (*Acacia decurrens*) ... | 9·9 | 25·8 | 23·32 |

The rimu and black birch were samples taken from a large quantity of bark ground for use in Messrs. Guilford and Co.'s tannery near Wellington. The rata is of the so-called "sugar-loaf" variety. The black wattle was grown in Adelaide, and was from a bulk of 150 tons at that time lying at the same tannery.

It will be seen from the above table that the black wattle yielded a much larger percentage of tannin than any other; but even that celebrated bark is not equal to the tanekaha, and it may well be doubted if there is any other substance in the vegetable kingdom yielding so large a percentage of tannin. The highest yield of tannin is found in galls or gallnuts, hard woody excrescences formed by an insect on the twigs of the dwarf oak (*Quercus insectoria*) of Syria and Asia Minor, and varying in size from a pea to a nutmeg. According to an analysis of Guibord, the yield of tannic acid from gallnuts is 65 per cent.

In the Handbook of New Zealand prepared by Dr. Hector, Director of the Geological Survey, the following table is given:—

### TAN-BARKS NATIVE TO NEW ZEALAND.

| Name. | Native Name. | Percentage of Tannin. |
|---|---|---|
| Bark of Phyllocladus trichomanoides ... | Kiritoatoa ... | 23·2 |
| " Elæocarpus dentatus... ... | Kirihinau ... | 21·8 |
| " Coriaria ruscifolia ... ... | Tutu ... | 16·8 |
| " Eugenia maire ... ... | Whawhako ... | 16·7 |
| " Weinmannia racemosa ... | Tawhero ... | 12·7 |
| " Elæocarpus hookerianus ... | Pokako ... | 9·8 |
| Wood of Fuchsia excorticata ... ... | Kotukutuku | 5·3 |
| Bark of Knightia excelsa ... ... | Rewarewa ... | 2·7 |
| " Myrsine urvillei ... ... | Mapau ... | 1·4 |

The principal sources of tannin, however, are from the bark of trees. For a long time it was supposed that the oak bark was the only sort suitable for yielding tannin, but now the list of barks producing tannin is a very long one, and moreover a great variety of other vegetable substances are used either alone or as an adjunct to the oak bark.

The bark of the hemlock spruce fir, the *Abies canadensis* of science, is one of the chief sources of tannin in the United States. About 100,000 barrels of hemlock bark extract are annually produced in America, and of this quantity a Boston firm alone manufactures 72,000 barrels. The tanneries in the United States consume annually 1,250,000 cords of hemlock bark, which is produced in nine States. As the yield of this bark is about 7 cords to an acre, the yearly consumption implies a clearing of 178,000 acres. The bark is usually stripped from the trees cut for timber; and, as the demand for hemlock timber exceeds the supply, both timber and bark will soon become exhausted.

The American chestnut is also very largely used in the United States for tanning purposes, and, on the authority of Dr. Campbell Morfit, is said to produce a tannin that will render leather far more solid and flexible than that prepared with oak.

I am indebted to the Commissioner of Agriculture at Washington for the following table showing the result of the analysis of various vegetable substances containing tannin, prepared for the International Exhibition at Philadelphia, together with the names of the places from which they were obtained:—

| | Per Cent. of Tannin. |
|---|---|
| Ground sumac (mixed), from Winchester, Va. ... | 24·18 |
| Sumac (*Rhus cotinus*), Hallsborough, Va. ... | 24·08 |
| Sumac (*Rhus glabra*), Georgetown, D.C. ... | 24·1 |
| Leaves of sweet fern (*Comptonia asplenifolia*), from near Boston, Mass.... ... ... ... | 9·42 |
| Leaves of *Polygonum amphibium*, from Nebraska ... | 11·6 |
| *Ephedra antisyphilitica*, from the table-lands of Arizona and Utah ... ... ... ... | 11·9 |
| Bark of sweet gum (*Liquidambar styraciflua*), from District of Columbia ... ... ... | 8·36 |
| Bark of red oak (*Quercus rubra*), from Canton, Ill.... | 5·55 |
| Bark of white oak (*Quercus alba*), from Canton, Ill. | 7·85 |
| Crushed quercitron bark (*Quercus nigra*), from Winchester, Va. ... ... ... ... | 6·47 |
| Bark of *Quercus coccinea*, from Canton, Ill. ... | 7·78 |
| Bark of *Quercus macrocarpa*, from Canton, Ill. ... | 7·85 |
| Bark of hemlock (*Abies canadensis*), from Van Ettanville, N.Y. ... ... ... ... | 9·5 |

Of the above barks, the sumac (*Rhus glabra*) yielded the largest percentage of tannin. It is used principally as a mordant for red colours, and is said to be an excellent febrifuge.

The tanekaha bark has long been known to the Maoris as a valuable dyeing material. They used it extensively in colouring their cloth, flax-mats, and basketware, and prefer it now to any other brown and yellow dye.

The bark is principally gathered by the settlers at Puhoi, near Mahurangi, and by he Natives on their own land at Hokianga, Bay of Islands, and Mangonui, all to the north of Auckland. They strip the tree of its bark by making a transverse cut around the trunk of the tree at the bottom, and a similar cut just below the junction of the branches. They then make vertical incisions with a keen knife and remove the bark in long narrow strips. The branches large enough to contain bark of any value are stripped in the same way. The tree, if not too large, is generally cut down and the bark is removed more easily. It is of no use to try to save the tree, as removing the bark invariably kills it. The tannin is deposited by the sap principally in the inner portion of the outer bark and the outer portion of the inner bark or liber.

It is the custom here to gather the bark in the winter. It should, however, be collected in the spring, for the tannin is most abundant at the time of the greatest flow of sap, which always occurs at that season. The reason for gathering the bark in the winter is that farmers and bushmen have more leisure for such work at that time. The bark, after it is pulled off, is carted in bulk to a settlement, where it is put up in bundles from 4 to 6 feet in length and shipped to Auckland, where it is reshipped to Europe. As it is bulky it is usually shipped as dunnage, consequently vessels seldom take it from more than one firm, so that in cleaning out the hold of the ship, after removing the cargo, there will be no trouble in separating it. The freight in this way costs only about £3 4s., or $15 36c., per ton to London.

If the bark were properly rasped, pressed, and shipped in bales, it would command a much higher price and give far more satisfaction to the manufacturers than the present mode of shipment.

Several American machines—among these, one by Mr. F. Gayton Clarke, of St. Augustine, Florida—have recently been invented for disintegrating bark, which could very advantageously be introduced here.

Nearly all this bark sooner or later finds its way to Grenoble, in the South of France, where it is used for the purpose of colouring kid gloves. Grenoble is said to be the largest manufacturing centre for kid gloves in the world.

The price of tanekaha bark in Auckland is usually about £8, or $38 40c., per ton. The price in London is fluctuating, and varies from £30, or $144, to £50, or $240, per ton. This fluctuation is said to be occasioned by the demand for the particular kind or shade of kid gloves which the bark is employed to colour. The French are said to possess a higher degree of skill in the art of leather-dyeing than the people of any other country. It is certain that the best and neatest-fitting kid gloves imported into Australasia come from France, where the greatest care is taken in the preparation and colouring of the skins. The skins are made uniform by shaving neatly with a sharp instrument any part that is thicker than another. The leather is next examined for imperfections, and if the slightest flaw is found in one of the skins it is laid aside. The cutting has to be done by hand. Each piece is carefully measured in order to allow the proper stretching-space. A Melbourne firm recently made a single purchase at Grenoble of 11,000 dozen skins to be prepared and coloured as wanted for the Australasian market.

The tanekaha tree is highly prized as an ornamental tree for parks and gardens. It does not readily bear transplanting, and like nearly all New Zealand forest trees begins to die as soon as the undergrowth and surrounding bush are cut away. It will however grow very well from the seed by sowing, and could easily be acclimatized, and especially in the States on the Pacific coast of the United States and also along the Gulf of Mexico, in Florida, Alabama, Mississippi, Louisiana and Texas, and in Georgia, South Carolina, and other southern States of the Union. The tree thrives well both on dry alluvial lands and on heavy loams, and also in light soils on hill sides.

The first shipment recorded of tanekaha bark occurred in 1873, when 21 tons were exported. It did not, however, attract much attention, and was not followed by a single shipment in 1874. In 1876 the extent of the export was 58 tons. In 1879 the amount rose to 105 tons, but declined in 1881 to only a single ton. In 1882 the amount rose to 52 tons, and during the first seven months of the present year the quantity exported was 375 tons. Of this quantity 24 tons were sent to New York. The following table shows the quantity and value of bark exported from the Colony of New Zealand for each year from 1873 to 1882 inclusive, and for the first seven months of 1883:—

| Year. | Quantity. | Value. | |
|---|---|---|---|
| | Tons. | £ | $ |
| 1873 ... ... ... | 21 | 219 | 1,051 |
| 1874 ... ... ... | Nil | Nil | Nil. |
| 1875 ... ... ... | 7 | 40 | 192 |
| 1876 ... ... ... | 58 | 300 | 1,440 |
| 1877 ... ... ... | 19 | 155 | 744 |
| 1878 ... ... ... | 49 | 694 | 3,331 |
| 1879 ... ... ... | 105 | 922 | 4,426 |
| 1880 ... ... ... | 120 | 706 | 3,389 |
| 1881 ... ... ... | 1 | 8 | 38 |
| 1882 ... ... ... | 52 | 345 | 1,656 |
| To July 31, 1883 ... | 375 | 3,075 | 14,760 |

It will be seen from the preceding table that the quantity exported during the present year is almost equal to the combined exports of all the preceding years.

The other New Zealand species of the Phyllocladus, like those of Tasmania and Borneo, are not used for economic purposes. The toatoa (*Phyllocladus glauca*), although a smaller, is, if possible, a more beautiful tree than the tanekaha (*Phyllocladus tricomanoides*). It rarely attains a height of more than 40 feet, with a trunk diameter of 18 inches. Its leaves, however, are much larger, and its mode of growth much more striking and luxuriant. Its timber is somewhat similar to that of the tanekaha, but is not used on account of its small size. It is found occasionally, in sheltered places, from Hokianga to Lake Taupo, in the North Island, but is nowhere very plentiful, and has not been observed farther south. I have had some of the dry bark analysed, which yielded 23 per cent. of tannin. The third species of this tree, the *Phyllocladus alpina*, is very much smaller than the others, and more like a shrub than a tree. It varies in height from 8 to 25 feet, according to situation. Its trunk never exceeds 12 inches in diameter. Its small size prevents any use being made of the timber, which is tough and durable. It is a mountain plant, rarely descending into lowland districts, and is found in various parts of the North Island south of Lake Taupo, and in the South Island, and especially in the sub-alpine forests of Nelson and Canterbury. No analysis of this species of the *Phyllocladus* has yet been made.

## THE CEMENT TRADE.

The large quantity and value of cement imported annually into New Zealand, together with the keen competition amongst the various manufacturers of hydraulic limes in the colony, furnish strong evidence of commercial activity and substantial progress. The total value of the imports of cement into New Zealand during the year ended the 31st December, 1883, was £52,905, or $253,944. In 1873 the value of these imports was only £23,235, or $111,528. The subjoined table shows the quantity and value of cement imported into the Colony of New Zealand for each year from 1873 to 1883 inclusive:—

| Year. | Quantity. | Value. | |
|---|---|---|---|
| | | £ | $ |
| 1873 ... ... | 25,300 barrels ... | 23,235 | 111,528 |
| 1874 ... ... | 27,740 „ ... | 34,640 | 166,272 |
| 1875 ... ... | 54,536 „ ... | 40,068 | 192,326 |
| 1876 ... ... | 72,588 „ ... | 60,730 | 291,504 |
| 1877 ... ... | 50,303 „ ... | 50,203 | 240,974 |
| 1878 ... ... | 101,769 „ ... | 81,471 | 391,061 |
| 1879 ... ... | 70,439 „ ... | 57,797 | 277,426 |
| 1880 ... ... | 115,156 „ ... | 86,212 | 413,818 |
| 1881 ... ... | 138,197 „ ... | 99,689 | 478,507 |
| 1882 ... ... | 143,382 „ ... | 102,054 | 489,859 |
| 1883 ... ... | 74,997 „ ... | 52,905 | 253,944 |

On the average five barrels are equal to 2,240 lb.

These imports consisted almost exclusively of what is known to the trade as "English Portland cement." The favourite brands here are those of Knight, Bevan, and Sturge; Robinson and Co.;

White Brothers; Francis, Son, and Co.; and the Victoria. Amongst the various brands imported in 1881 there were 100 barrels of the "Star" brand, Stettin, Germany; and in 1882 there were 90 barrels bearing the name of the "National Portland Cement Company," of Kingston, New York. The average price of cement in Auckland is 16s., or $3 85c., per barrel of 3½ bushels each, and in Wellington about the same. Good English cement will sometimes sell as low as 14s., or $3 36c., per barrel, and when the demand is great and the supply limited it will bring as much as 18s., or $4 32c., and 19s., or $4 56c, per barrel. The duty charged on cement imported into New Zealand is 1s. or 24c. per barrel. Previous to the invention of Portland cement all concretes, including those used by the Romans, had lime as a cementitious constituent, and it is very generally admitted by scientists that the buildings constructed in ancient times were quite equal, if not superior, in strength and durability to those of the present day. Modern Roman cement was invented by Parker in 1791. He gave it the name of Roman cement under the impression that he had discovered the method used by the Romans in the manufacture of their mortar; but this impression was not a correct one. It is now known that the ancient Roman cement was principally made from pozzuolana, a ferruginous ash from Mount Vesuvius and other volcanoes. Modern Roman cement was first made from the septaria nodules of the clay formations of London. The stone from which the cement was made yielded the following analysis:—

| | |
|---|---|
| Carbonate of lime | 0·690 |
| Magnesia | 0·002 |
| Oxide of iron | 0·037 |
| Oxide of magnesia | 0·012 |
| Silica | 0·180 |
| Alumina | 0·066 |
| Water | 0·013 |
| | 1·000 |

This cement is of the same brownish colour as that used by the ancient Romans, and possesses remarkable setting properties, but does not attain any special degree of hardness or strength.

Portland cement has been in use about sixty years. It was first made by Joseph Aspadin, a bricklayer, in 1824, and called Portland cement on account of its resemblance to Portland stone. Some time elapsed before its merit was recognized. The Germans were the first to discover its value by scientifically testing it. In England it is manufactured principally on the Thames, the Tyne, and the Medway Rivers. The two essential ingredients are chalk and clay. The clay is obtained by dredging along the shores of the above-named rivers. The proportion of chalk or rich lime varies from 60 to 80 per cent., and the clay from 20 to 40 per cent. The two ingredients are thoroughly mixed together until the whole is formed into a creamy mass. The water is then run off, and the substance dried and broken into lumps, and then calcined by baking in ovens, after which it is ground into an impalpable powder, put in barrels, and is then ready for use. The following table will show within a moderate divergence of range the analysis of the ingredients:—

| | |
|---|---|
| Lime ... ... ... ... ... | 60·05 |
| Magnesia ... ... ... ... | 1·17 |
| Alumina ... ... ... ... | 10·84 |
| Silica ... ... ... ... ... | 24·31 |
| Alkalies ... ... ... ... | 1·54 |
| Water ... ... ... ... ... | 2·09 |
| | 100·00 |

At one time considerable quantities of Portland cement were imported into the United States from England, and the imports are still large; but the article is being gradually replaced by cements of American manufacture.

It has been pointed out again and again in the United States that every layer of the clay used in the manufacture of English Portland cement is of a different chemical construction, and that the cement varies in quality with the different layers mixed. The American manufacturers claim that they do not labour under such difficulties, and that they are able to produce cement of uniform quality and standard test grades.

Mr. Henry Reid, a celebrated English civil engineer, and the author of several valuable books on natural and artificial concretes, admits that the American manufacturers are not wide of the mark when they say that chalk-and-fine-clay cements are unreliable, owing to the variable quality of the clay used in their manufacture. He also says that the difficulty of obtaining the finest and best-suited river-mud or clay is becoming daily more and more apparent. Should coal-gas be superseded by the electric light, Mr. Reid thinks that the English cement-makers will lose one advantage over foreign makers in the increased cost of fuel, now obtained on such favourable terms from gasworks.

The best known brands of American Portland cement are those manufactured in Ulster County, New York. At the International Exhibition at Philadelphia it was found that the average strength per square inch of the cement made by the National Portland Cement Company, Kingston, New York, was greater than that of any other. General Gillmore, author of a work on Portland cements, certified to the fact that the tests were made by mixing the cement, dry in each case, with an equal measure of clean sand, and tempering the mixture with water to the consistency of stiff masons' mortar, and then moulding it into briquettes of suitable form for obtaining the tensile strength on a sectional area 1½ inches square, equal to 2¼ square inches. The briquettes were kept in the air one day to set, then immersed in water six days, and tested when seven days old. After thus obtaining the tensile strength in each case, the ends of the specimens were ground down to 1½-inch cubes, which were used the same day for obtaining the compressive strength by crushing. The subjoined table shows the crushing and tensile strength of the various kinds of cements experimented upon, with the name of the exhibitor and place of manufacture :—

| Name of Exhibitor and Place of Manufacture. | Crushing Strength. | | Tensile Strength. | |
|---|---|---|---|---|
| | Average Strength per Square Inch. | Number of Trials. | Average Strength per Square Inch. | Number of Trials. |
| | lb. | | lb. | |
| National Portland Cement Company, Kingston, New York .. .. .. .. .. .. | 1,482 | 20 | 213 | 5 |
| Toepffer, Grawitz, and Co., Stettin, Germany .. .. | 1,439 | 12 | 216 | 3 |
| Hollick and Co., London, England .. .. .. | 1,330 | 10 | 216 | 3 |
| Wouldham Cement Company, London, England .. | 1,140 | 12 | 199 | 3 |
| Saylor's Portland cement, by Coplay Cement Company, Coplay, Pennsylvania .. .. .. .. | 1,078 | 8 | 184 | 2 |
| Wampum Cement and Lime Company, New Castle, Pennsylvania .. .. .. .. .. | 968 | 12 | 168 | 3 |
| Pavin de Lafarge, Teil, Canton of Viviers, France .. | 931 | 12 | 158 | 3 |
| A. H. Lavers, London, England .. .. .. | 926 | 6 | 192 | 2 |
| Francis and Co., London, England .. .. .. | 907 | 14 | 163 | 3 |
| William McKay, Ottawa, Canada .. .. .. | 882 | 10 | 141 | 3 |
| Borst and Roggenkamp, Delfzyl, Netherlands .. .. | 826 | 12 | 132 | 3 |
| Longuetz and Co., Boulogne-sur-Mer, France .. .. | 764 | 12 | 108 | 3 |
| Riga Cement Company, by C. X. Schmidt, Riga, Russia | 693 | 5 | 134 | 2 |
| Scaman Cement Company, Lomma, near Malmo, Sweden | 606 | 14 | 112 | 3 |
| Bruno Hofmurk, Port-Kund, Esthland, Russia .. | 580 | 6 | 154 | 2 |

A number of recent European authorities on concretes express a decided preference for the American method of testing cement-work. The American machines were the first to overcome the difficulty of bringing force to bear fairly upon the part to be tested. Mr. Reid, in his excellent work on "Portland Cement, its Manufacture and Uses," commends very highly Professor Thurston's testing-machine. Mr. Reid states emphatically that Professor Thurston's machine fully recognizes and measures every known strain, and proves scientifically their respective values. He says further: "Its testing powers are almost unlimited, and indicate by an autographic registry the strength, elasticity, homogeneousness, and resilience of the submitted sample." Professor Reynolds, of Manchester, also declares the American method to be by far the best in use. He thinks that it is a question more of a test of tension than of compression, and says that the whole result is shown by Professor Thurston's method. The Portland cement manufactured from the native hydraulic limestones of New Zealand has met with such favour that it will not improbably be very extensively used at an early day in the construction of the public works of the colony. The Government has called for tenders for 100 tons for public works.

During the past ten years experiments with the limestones at Whangarei for the manufacture of a good article of Portland cement have been conducted, and the results have been satisfactory. The cement produced, after being tested by the most approved methods, showed that it would neither expand nor contract, but always retained its normal dimensions.

Comparative tests were made with some of the best-known English brands, and the result of these tests is given below :—

| Average Tensile Strength. | Pounds to Sq. Inch. |
|---|---|
| *Colonial Cement :—* | |
| Six briquettes tested by the District Engineer, Auckland, May, 1881; seven days' test ... | 250·7 |
| Briquettes tested by Messrs. Ware and Jones, contractors, Lyttelton Dock, July, 1881; seven days' test ... ... ... | 333·33 |
| Eight briquettes tested in Wellington by Government Engineer, September, 1881; seven days' test ... ... ... | 249 |
| Fifteen briquettes, 3 of sand to 1 of cement, Wellington, September, 1881; twenty-eight days' test ... ... ... ... | 135 |
| *English Cement :—* | |
| Three briquettes, cement taken from centre of barrel, Wellington, September, 1881; seven days' test ... ... ... ... | 306 |
| Three briquettes, 3 of sand to 1 of cement, Wellington, September, 1881; twenty-eight days' test ... ... ... ... | 131 |

It will thus be seen that New Zealand Portland cement, when mixed with sand (the most important test), bore a higher tensile strain than the English Portland, although when mixed neat it did not quite equal the English cement.

The machinery used in manufacturing this cement consisted of a Blake's stone-crusher, an intermediate crusher, a disintegrator, a pair of 46-inch French burr stones, and a 12-horse-power engine. The kiln was capable of turning out about 10 tons per week. The purpose of the managers of these works is to remove the plant to Limestone Island, Whangarei Harbour, Auckland District.

The limestone on Limestone Island has been analysed by Dr. Hector, and the following is his report :—

ANALYSIS OF SPECIMEN No. 3,063—SIX SAMPLES OF LIMESTONE.

| Constituents. | 1. | 2. | 3. | 4. | 5. | 6. |
|---|---|---|---|---|---|---|
| Carbonate of lime ... | 78·93 | 62·40 | 80·29 | 63·63 | 68·53 | 58·91 |
| Carbonate of magnesia | 1·89 | 2·16 | 2·42 | 2·14 | 1·64 | 1·82 |
| Alumina and iron oxide | 3·01 | 8·41 | 4·64 | 7·60 | 5·41 | 7·41 |
| Siliceous matter (principally clay) ... ... | 15·79 | 26·32 | 12·26 | 25·99 | 24·02 | 31·40 |
| Water ... ... | 0·38 | 0·71 | 0·39 | 0·64 | 0·40 | 0·46 |
| | 100·00 | 100·00 | 100·00 | 100·00 | 100·00 | 100·00 |

Limestone Island has an area of 100 acres, and is surrounded by deep water. The height of the island is 300 feet above sea-level.

The stone is a good hydraulic limestone, nearly grainless, and, as the whole island is composed of this stone, covered only with a thin coating of earth, the supply is practically inexhaustible.

Cement made from this limestone exhibited the following analysis:—

| | | |
|---|---|---|
| Lime ... | ... ... ... ... | 57·66 |
| Magnesia | Soluble in acid used ... | 1·61 |
| Alumina | | 8·83 |
| Iron oxides | | 1·28 |
| Silica | | 27·01 |
| Carbonic acid | ... ... ... ... | 2·82 |
| Water ... | ... ... ... ... | Traces |
| Insoluble residue | ... ... ... | 0·79 |
| | | 100·00 |

By this analysis it will be seen that the Portland cement produced from the Limestone Island stone is of excellent quality. The cement was made by the double-kilning process, without any addition whatever, except water for the purpose of mixing.

Cement has also been made at Kamo. The stone used contained about 84 per cent. of carbonate of lime. This was calcined, and combined with clay from the Kamo Colliery mine.

The following are details of tests of the quality of cement manufactured at the Kamo Cement Works, 1882:—

| Briquette. | Age. | Strain of Briquette. | Strain per Square Inch. | Remarks. |
|---|---|---|---|---|
| | | lb. | lb. | |
| 1 | 7 days | 510 | 226 | Neat cement; medium burnt. |
| 2 | „ | 370 | 163 | „ heavy burnt. |
| 3 | „ | 500 | 222 | „ mixed medium and heavy. |
| 4 | „ | 390 | 173 | Sand and cement; 1 sand to 3 of cement. |
| 5 | „ | 760 | 337 | Neat cement; two days in water, five in air; faulty. |
| 6 | „ | 560 | 248 | Neat cement; bad shape. |
| 7 | „ | 570 | 253 | „ „ |
| 8 | „ | 380 | 168 | One day in air, six in water. |
| 9 | „ | 460 | 204 | „ „ |
| 10 | „ | 420 | 186 | „ „ |
| 11 | „ | 450 | 200 | „ „ |
| 12 | „ | 390 | 175 | „ „ |
| 13 | „ | 440 | 195 | „ „ |
| 14 | „ | 390 | 175 | Mixed medium and heavy burnt. One day in air, six in water. |
| 15 | „ | 395 | 175 | One day in air, six in water. |
| 16 | „ | 310 | 137 | Hand-mixed briquette by Government overseer. |

Briquettes Nos. 5 to 16, inclusive (neat cement), and Nos. 1 to 4 (sand and cement), were made and tested under the supervision of the Government Resident Engineer, Mr. W. H. Hales, Auckland.

| Number of Briquette. | Age. | Strain per Briquette. | Strain per Square Inch. | Remarks. |
|---|---|---|---|---|
| | | lb. | lb. | |
| 1 | 7 days | 360 | 160 | 3 sand to 1 cement. |
| 2 | " | 405 | 180 | " |
| 3 | " | 369 | 164 | " |
| 4 | " | 310 | 137 | " |

The average of neat cement tests shows out of fifteen briquettes a tensile strain of 461 lb. per briquette, or 204$\frac{8}{9}$ lb. per square inch. The Government standard, which is 200 lb. on an average of not less than three briquettes, has been thus exceeded. The sand-and-cement tests show an average of 162$\frac{4}{5}$ lb. per square inch. This is a seven days' test. The standard sand-and-cement strain required in England is 112 lb. in twenty-eight days, which has thus been far exceeded even in seven days.

Dr. Hector is of the opinion that New Zealand will not long be dependent on foreign markets for Portland cement. The natural cement-stones of the colony he thinks quite equal, if not superior, to those burnt for the manufacture of hydraulic lime in Europe. I am indebted to Dr. Hector for the following table showing the component parts of the natural cement-stones at Moeraki and Amuri, in the South Island of New Zealand. Numbers 1 and 3 are analyses of the whole nodules, while numbers 2 and 4 are without the calcareous veins. The Moeraki stones are hard and compact, of a mottled-grey colour; specific gravity, 2·655; hydroscopic water, 60 per cent. The stones from Amuri are of similar character. Those of England and France are given for comparison:—

| Constituents. | New Zealand. | | | | England. | France. |
|---|---|---|---|---|---|---|
| | Moeraki. | | Amuri. | | Sheppey. | Boulogne. |
| | 1. | 2. | 3. | 4. | | |
| Carbonate of lime ... | 72·4 | 50·8 | 68·6 | 54·9 | 69·0 | 63·9 |
| Carbonate of magnesia | ·3 | ... | 1·7 | 1·5 | ... | ... |
| Alumina and iron oxides | 8·7 | 7·6 | 6·5 | 6·4 | 10·5 | 12·3 |
| Soluble silica ... ... | ·8 | ... | 1·0 | 1·0 | 18·0 | 15·0 |
| Sand and clay ... | 17·8 | 41·6 | 31·2 | 31·9 | | |
| Water ... ... | ·6 | ... | 1·1 | 1·2 | 1·3 | ·6 |

There are now four companies at Mahurangi alone engaged in the manufacture of hydraulic limes. The most extensive is that of J. Wilson and Co., situated about two miles below Warkworth, on the south bank of the Mahurangi River, Auckland District. This firm was the first to engage in the hydraulic-lime industry in this colony. Lime was produced where their works now stand as far back as 1851. They experienced great difficulty in slaking the lime, and the industry was for a time discontinued, but was started again in 1878. In 1878 they had only two kilns working at irregular intervals. Now, in 1883, they have eighteen kilns in full operation, and turn out about 350,000 bushels per annum. The supply of suitable stone accessible to the works is practically inexhaustible. The stone is burnt as it comes from the quarry. It is then taken to the crushing mills and reduced to powder without being touched by water. The machinery consists of one of Mottes's Universal Crushers. The lime is then passed through a sieve, and the coarse particles are placed under a crusher, being passed through the stones again and sifted so as to produce a uniform article. The proprietors are not entirely satisfied with their present method of grinding lime, and I have no doubt that the industry here could be greatly improved by the introduction of American machinery. Mottes's Universal Crusher is like a mortar without a bottom, and is so arranged that it can be raised or lowered at pleasure so as to reduce the material to whatever size is required. The pestle is driven by an excentric on its head, which produces an oscillating motion and crushes the stone against the walls of the mortar. The kilns are all built of concrete and lined with brick. They are 5 feet across the top, tapering to 2 feet 6 inches at the base. Between each kiln at the top there is a wall 18 inches thick. The fuel and raw stone are put into the kiln at the top, and the burnt lime drawn from below at stated periods. The fires are kept burning all the time, except when the brick lining needs repairing. The heat is often so intense as to melt the brick, but it has no injurious effect whatever on the concrete behind.

Other hydraulic-lime works are conducted on the same principle; but Wilson and Co. state that the stratum from which their stone is taken differs in chemical composition from all others found in the district. The stratum is on an edge, forming, as it were, a large reef, striking west, and dipping at an inclination of 45° N. The stone is soft, and, when exposed to the action of the weather, soon falls into powder, like a piece of clay. When broken it fractures into thin flakes. There is no grit in the stone, nor the slightest trace of fossils.

The natural prejudice against all new materials for some time prevented the use of native hydraulic lime in the construction of important works in this colony. One of the first structures of importance in which it was used was a retaining sea-wall, 15 feet in height and 400 feet in length, erected at Mangonui about three years ago for the Auckland Timber Company. Mr. George Holdship, the managing director of that company, wished to erect a saw-mill at Mangonui, and found it necessary to build a retaining sea-wall. The only material available without heavy expense consisted of Wilson's hydraulic lime and the beach-gravel or shingle so abundant in the neighbourhood. The two ingredients were mixed together one part of lime to six parts of gravel, and run into blocks of concrete of suitable size, and, when dried, were used for the foundation and for that part of the wall just above the action of the tide, the remainder being finished in courses. The wall proved to be a great success, the material answering all the purposes of the very best stone. The result has made the lime very popular. Wilson's Mahurangi hydraulic lime has also been used in the construction of the foundation of the large four-storey building in Queen Street, Auckland, erected for Mr. Thomas Russell, C.M.G., of London.

The manufacturers of the Mahurangi lime do not claim that their product is equal to Portland cement; but it is well known that it will answer the purpose of about 90 per cent. of work done with cement, at a much lower cost. It will not set as quickly as Portland cement, but it will resist the action of fresh and salt water fully as well. It has great adhesive properties, and every part of it sets evenly and firmly. The following table shows the tests of Wilson and Co.'s Mahurangi hydraulic lime for concrete and mortar:—

BREAKING-TESTS on Supports 6 inches apart, ⅞-inch round Bar placed across Centre.

| No. | Description of Material. | Age of Block. | Time in Water. | Size of Block. | Broke at |
|---|---|---|---|---|---|
| 1 | Pure ground lime .. .. | 32 days | 30 days | 2″ x 2″ x 9″ | 246 lb. |
| 2 | „ „ „ .. .. | 7 „ | 5 „ | „ | 110 „ |
| 3 | 5 parts black scoria ash and 1 part ground roche .. .. | 62 „ | 60 „ | „ | 206 „ |

All these tests were carried out with ground roche, used without slaking, and set immediately after mixing and without pressure.

I give below a table showing the analysis of this lime furnished me by Mr. J. A. Pond, the Colonial Analyst in Auckland:—

| | |
|---|---|
| Silica and silicates insoluble in acid ... ... | 18·20 |
| Silica soluble in dilute hydrochloric acid ... | 11·30 |
| Iron peroxide ... ... ... ... | 2·40 |
| Alumina... ... ... ... ... | 5·90 |
| Lime ... ... ... ... ... | 60·32 |
| Magnesia ... ... ... ... | ·75 |
| Alkalies... ... ... ... ... | ·13 |
| Carbonic acid ... ... ... ... | 1·00 |
| | 100·00 |

The competition of the various manufacturers has brought the prices of hydraulic lime to very low rates. The following are the prices at which Wilson and Co.'s Mahurangi hydraulic lime can be obtained in Auckland, with cartage added:—

| | s. | d. | c. |
|---|---|---|---|
| Ground roche, per bushel ... ... | 1 | 9 or | 42. |
| Rough roche ... ... ... | 1 | 3 or | 30. |
| Plastering ... ... ... ... | 1 | 6 or | 36. |
| Slake ... ... ... ... | 1 | 0 or | 24, |

The Warkworth Cement Company has recently enlarged its works in order to meet the steadily-increasing demand for their product. Some of the heaviest structures in Auckland were erected on concrete foundations made of this lime. All these buildings have given satisfaction, even where the foundations were laid on reclaimed ground to the depth of 16 to 25 feet, and when the trenches were filled with water.

The following is an analysis of the stone found on the property of the Warkworth Cement Company:—

| | |
|---|---|
| Carbonate of lime | 71·00 |
| Silica and alumina and oxide of iron | 24·20 |
| Silicate of magnesia | 1·00 |
| Alkalies and moisture | 3·80 |
| | 100·00 |

An analysis of this stone was also made at my request by Mr. Pond, and the following is his report:—

| | |
|---|---|
| Silica and silicates insoluble in dilute acid | 23·05 |
| Silica soluble in dilute hydrochloric acid | ·50 |
| Carbonate of lime | 70·85 |
| Carbonate of magnesia | ·97 |
| Alumina | 1·70 |
| Iron peroxide | ·50 |
| Alkalies | ·10 |
| Moisture | 2·33 |
| | 100·00 |

Some of the limestone in the Mahurangi District has also been analysed by Dr. Hector, and I am indebted to that gentleman for the subjoined table:—

| | |
|---|---|
| Carbonate of lime | 68·78 |
| Carbonate of magnesia | 2·29 |
| Iron and aluminium oxides | 4·58 |
| Siliceous matters | 21·16 |
| Water | 3·19 |
| | 100·00 |

This stone is not wholly unlike that used by the Round Top Cement Works, near Hancock, Maryland.

The Engineer of the Auckland Harbour Board is so impressed with the great value of the New Zealand hydraulic limes that he has recommended the Board to use the native limes instead of Portland cement in the construction of the Calliope Dock. He argues that the work will not only be equally stable, but far more inexpensive.

Stone suitable for the manufacture of hydraulic lime is found at Raglan and various other parts of New Zealand. The layers at the Kaipara Flats occupy a large extent of country.

The New Zealand cements are more even in quality than those imported. On the 29th December, 1883, Mr. J. A. Pond made an analysis of a fair sample of English Portland cement in order to show its condition upon its arrival here, and the following is the result:—

| | |
|---|---|
| Silica and silicates insoluble in dilute acids | 16·70 |
| Silica soluble in dilute hydrochloric acid | 6·50 |
| Lime | 60·48 |
| Alumina | 5·70 |
| Iron peroxide | 4·70 |
| Carbonic acid | 2·50 |
| Sulphuric acid | 1·13 |
| Moisture | ·20 |
| Alkalies | 1·30 |
| Loss | ·79 |
| | 100·00 |

Various kinds of concretes are used in New Zealand. A good concrete for building purposes and for bedding street tramways, in use here, is composed of one part of cement, three parts of sharp sand, twelve parts of shingle or gravel of all sizes, from 2 inches down to fine gravel. These sixteen parts when mixed all go into the bulk of twelve of the above parts, so that the proportion is as one to twelve of the finished work, or as one to fifteen of the aggregate separately measured.

The popularity of concrete for building purposes is shown by the large number of handsome residences made of this material. The builders recommend that in preparing the material every particle of the aggregate should be surrounded by a film of lime.

Concretes for different purposes require various-sized aggregates, and, to obtain the best possible results from any given quantity of lime, the aggregate should be increased in regular order from coarse sand to 2½ inches, or from coarse sand to 2 inches, or from coarse sand to 1 inch, or from coarse sand to ⅝ of an inch. An aggregate graduated as described will make a perfectly solid mass, having the least possible surface to cover with lime. "Aggregates" mean the material to mix with lime to form the body of the concrete or mortar. Various materials are used for aggregates—red or black scoria-ash, burnt clay, river gravel, pit gravel, broken limestone, in fact any hard clean stone. Scoria, however, in the Auckland District, is regarded as the best material to be used, especially if it has been crushed. The fine particles of iron and lime found in it doubtless increase its value as an aggregate.

The frames used in building concrete walls consist of a series of framed side-pieces of a width equal to the height of the wall intended to be built. These side-frames are arranged all round the building, and are hooked on to vertical standards placed in pairs one on each side of the wall. The side-frames and standards are kept apart to the extent of the intended thickness of the wall by distance-tubes of iron, through which bolts pass holding everything securely. When the concrete is sufficiently set, each side is unhooked from the standards and rehooked one division higher. The standards are of various lengths, admitting of from four to six shiftings of the frames. When ready to be moved the standards are unbolted and fastened at the next required height. The distance-tubes through which the bolts pass are inserted at regular heights, so that the standards can be moved when required. After the wall is finished the tubes are withdrawn. Many variations in detail occur, but the general principle is not changed. The walls should be carried up as near one level as possible. According to the instructions of Messrs. Wilson and Co. the only departure from this rule should be in the depth of the building-frames. Each day's work should be finished at an angle of 45 degrees. This gives the builder an opportunity to shift up the frames filled the day before, so as to have them ready to refill when the men get back to the starting-point. This process is repeated throughout, thus working it like a spiral stair having no end until the last course is finished.

In Wellington, especially, and in other cities in New Zealand, concrete slabs are used for paving the side footpaths, and concrete blocks for the water-channels along the streets. The slabs were patented in 1880 by Mr. C. O'Neill, civil engineer, for street paving, and are composed of a mixture of three parts of well-washed coarse sand, sifted through a $\frac{3}{8}$-inch mesh, to one part of Portland cement. The ingredients are brought to the consistency of well-tempered mortar, and then run into frames which are $2\frac{1}{4}$ in. thick by 2 ft. wide, and of lengths from 1 ft. 6 in. to 3 ft. 9 in. The slabs are allowed to remain upon the floor where they are made for eight or nine days—after the second day being well watered and the frames removed. They are then stacked in open yards with air space between each slab, the watering process being continued until they are seasoned, about four months, when they are ready for use Pavement of this kind has been laid down in Wellington for seven years, and shows very little signs of wear, though subjected to much traffic.

The concrete channel and kerb blocks are moulded with the same description of cement-mortar, but three parts of clean broken stone are added.

## AGRICULTURAL PRODUCTS.

The last harvest was one of the most bountiful in the history of the colonies. The yield of wheat in some districts was disappointing, but upon the whole the average was larger than usual. The harvest is over in all the Australasian Colonies by the month of March.

At one time South Australia was the premier colony in wheat-production of the Australasian group, but such is not now the case: instead of occupying the first place she is the third in the list. In 1873 South Australia produced 2,000,000 bushels of wheat more than Victoria, and nearly twice as much as New Zealand. In 1882 Victoria headed the list with 8,714,377 bushels, and New Zealand followed with 8,297,890 bushels, while the total yield in South Australia was 8,087,032 bushels. New South Wales followed with 3,405,966, Tasmania 977,365, Western Australia 153,657, and Queensland 39,611 bushels. In 1883 New Zealand headed the list with 10,270,591 bushels, and Victoria followed with 8,751,454 bushels, while the total yield in South Australia was 7,356,117 bushels. New South Wales followed with 4,042,395, Tasmania 946,889, Western Australia 249,900, and Queensland 145,752 bushels. The total quantity of wheat produced in 1873 in Australasia was 17,936,715 bushels. In 1882 it had increased to 29,675,899 bushels. In 1883 the total quantity was 31,763,098 bushels. As the total population is about 3,000,000, it will be seen that the quantity of wheat produced is more than sufficient to feed twice that number of people.

A short time ago several agricultural societies in Australia instructed Mr. Ralph Waldo Emerson McIvor, an agricultural chemist of some note, to proceed to New Zealand with the view of investigating the causes of the enormous yield of grain per acre grown in New Zealand. Mr. McIvor travelled extensively in the colony, and visited the principal agricultural districts in the North and South Islands. He collected many samples of soil, analysed them, and arrived at the conclusion that the superiority of the New Zealand climate was the chief cause of the large yield of grain per acre. He found, in addition to the fertility of soil, a suitable distribution of warmth and moisture. He said, however, that in some parts of Australia, such as Gippsland, Victoria, the soil was chemically richer than that of New Zealand, but the richness of the soil he thought of little value when the rainfall was insufficient for the growth of crops. A few months ago a deputation of Australian farmers arrived in Auckland for the purpose of pursuing investigations similar to those of Mr. McIvor. The deputation visited many places in the Waikato District, and in other parts of the colony. Everywhere they found the same evidences of productiveness. New Zealand, like the rich agricultural districts in the United States, is well watered. The rivers of course are not so extensive as those of a continent, but they are certainly unusually large for the size of the islands.

New Zealand forms a striking contrast to Australia, the greater part of which consists of vast plains, with a range of mountains fringing the eastern side of that island-continent; whereas New Zealand has many mountain-spurs. The many rivers fed by mountain-streams, the large bays and estuaries all around the coast, and the minor streams and lakes stretching like silver threads through the land, show that water, the great nourisher of the earth, is found in every part of the colony. It is worthy of mention here that many places in New Zealand derive their names from the Maori word *wai*, water: for we have *Wairoa*, long water, or river; *Waiwera*, warm water; *Waipa*, the river of the fort; *Waiuku*, the clay water; *Waikato*, high water; *Waiheke*, flowing water; *Waikomeu*, talking water; and so on through an almost interminable labyrinth of names. The subjoined table gives the land under cultivation in each district of New Zealand, and the agricultural produce, being the result of a collection of statistics made in February, 1883:—

## LAND UNDER CULTIVATION, AND AGRICULTURAL PRODUCE, 1883.

| Districts. | Holdings over 1 Acre. | | Land broken up, not under Crop. | In Wheat. | | In Oats. | | | In Barley. | | In Potatoes. | | Number of Acres under Crop, exclusive of Land under Grasses. | In Sown Grasses. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Freehold. | Total Numbers of Holdings. | Acres. | Acres. | Estimated Gross Produce (in bushels). | Acres. Green Food or Hay. | Acres. For Grain. | Estimated Gross Produce of Grain (in bushels). | Acres. | Estimated Gross Produce (in bushels). | Acres. | Estimated Gross Produce (in tons). | | Acres in Hay. | Estimated Gross Produce (in tons). | Acres in Grasses after having been broken up. | Acres Grass-sown Lands not previously ploughed. |
| Auckland 1883 | 4,915 | 6,128 | 27,437 | 10,888 | 245,621 | 8,393 | 3,488 | 83,877 | 446 | 8,923 | 4,738 | 16,049 | 44,681 | 11,958 | 13,294 | 285,662 | 310,655 |
| „ 1882 | 4,704 | 6,064 | 26,973 | 8,100 | 213,842 | 7,589 | 3,268 | 88,319 | 427 | 10,515 | 5,208 | 29,623 | 40,793 | 16,615 | 19,454 | 264,962 | 292,844 |
| Taranaki 1883 | 979 | 1,408 | 2,014 | 4,198 | 122,367 | 308 | 3,180 | 96,048 | 66 | 1,897 | 548 | 2,456 | 12,034 | 1,795 | 2,290 | 37,877 | 113,990 |
| „ 1882 | 943 | 1,331 | 1,351 | 2,960 | 76,771 | 375 | 1,975 | 60,019 | 94 | 2,363 | 644 | 3,154 | 9,056 | 2,703 | 4,212 | 35,419 | 93,002 |
| Hawke's Bay 1883 | 727 | 1,155 | 12,717 | 1,148 | 26,598 | 771 | 4,372 | 90,081 | 349 | 12,926 | 1,146 | 3,529 | 10,786 | 9,112 | 13,122 | 122,119 | 576,363 |
| „ 1882 | 683 | 1,082 | 0,484 | 1,608 | 44,503 | 957 | 3,947 | 88,582 | 296 | 7,252 | 840 | 5,037 | 10,320 | 9,720 | 14,349 | 103,514 | 579,233 |
| Wellington 1883 | 2,205 | 3,524 | 6,057 | 15,038 | 363,022 | 1,808 | 10,549 | 255,038 | 837 | 18,612 | 1,141 | 5,644 | 38,651 | 5,623 | 8,497 | 117,089 | 740,069 |
| „ 1882 | 2,142 | 3,389 | 5,027 | 12,013 | 278,884 | 2,369 | 8,902 | 259,150 | 640 | 18,484 | 1,537 | 9,750 | 33,269 | 7,353 | 11,084 | 121,475 | 750,426 |
| Marlborough 1883 | 420 | 644 | 3,367 | 3,252 | 77,533 | 1,807 | 2,417 | 73,480 | 3,787 | 104,165 | 457 | 3,044 | 14,082 | 1,094 | 1,629 | 28,064 | 49,717 |
| „ 1882 | 424 | 647 | 10,401 | 3,789 | 88,780 | 1,408 | 2,080 | 58,918 | 2,669 | 76,518 | 587 | 3,756 | 12,282 | 1,085 | 1,471 | 22,574 | 38,233 |
| Nelson 1883 | 909 | 1,635 | 2,162 | 2,327 | 42,231 | 4,914 | 2,264 | 39,932 | 3,572 | 66,379 | 1,074 | 5,753 | 18,850 | 3,204 | 3,558 | 48,102 | 79,793 |
| „ 1882 | 866 | 1,605 | 4,551 | 3,207 | 55,394 | 4,137 | 2,105 | 47,028 | 3,009 | 63,230 | 1,145 | 5,366 | 18,048 | 3,232 | 4,206 | 49,108 | 76,066 |
| Westland 1883 | 237 | 344 | 272 | ... | ... | 418 | 8 | 220 | ... | ... | 218 | 714 | 752 | 239 | 177 | 3,381 | 6,636 |
| „ 1882 | 229 | 319 | 82 | 2 | 32 | 411 | 10 | 233 | 2 | 4 | 247 | 824 | 1,015 | 208 | 220 | 3,503 | 6,286 |
| Canterbury 1883 | 3,843 | 5,928 | 74,761 | 249,163 | 6,359,992 | 14,015 | 136,487 | 4,086,965 | 14,443 | 378,457 | 5,120 | 32,401 | 552,454 | 16,855 | 19,038 | 726,274 | 253,808 |
| „ 1882 | 3,649 | 5,806 | 100,662 | 237,015 | 5,047,883 | 19,633 | 102,370 | 2,540,591 | 17,728 | 347,075 | 5,930 | 31,508 | 502,404 | 15,647 | 16,917 | 674,895 | 176,050 |
| Otago 1883 | 4,523 | 6,586 | 66,611 | 104,804 | 3,033,227 | 33,032 | 157,093 | 5,794,787 | 4,646 | 145,804 | 6,046 | 34,991 | 441,005 | 11,174 | 14,159 | 650,396 | 172,567 |
| „ 1882 | 4,092 | 6,055 | 89,021 | 97,021 | 2,491,801 | 24,552 | 118,730 | 3,782,008 | 4,943 | 138,652 | 6,402 | 32,872 | 375,108 | 11,860 | 17,168 | 496,425 | 154,054 |
| Totals 1883 | 18,758 | 27,352 | 195,398 | 390,818 | 10,270,591 | 65,466 | 319,858 | 10,520,428 | 28,146 | 737,163 | 20,488 | 104,581 | 1,133,295 | 61,054 | 75,764 | 2,018,964 | 2,303,598 |
| „ 1882 | 17,732 | 26,298 | 248,552 | 365,715 | 8,297,890 | 61,431 | 243,387 | 6,924,848 | 29,808 | 664,093 | 22,540 | 121,890 | 1,002,485 | 68,423 | 89,081 | 1,771,875 | 2,166,194 |
| Increase in 1883 | 1,026 | 1,054 | ... | 25,103 | 1,972,701 | 4,035 | 76,471 | 3,595,580 | ... | 73,070 | ... | ... | 130,810 | ... | ... | 247,089 | 137,404 |
| Decrease in 1883 | ... | ... | 53,154 | ... | ... | ... | ... | ... | 1,662 | ... | 2,052 | 17,309 | ... | 7,639 | 13,317 | ... | ... |

It will be seen from the preceding table that in February, 1883, New Zealand had 2,018,964 acres in grasses after having been broken up, against 1,771,875 in 1882, an increase of 247,089. The number of acres of grass-sown lands not previously ploughed in 1883 was 2,303,598, against 2,166,194 for 1882, an increase of 137,404. It is but just to add that the increase in the number of acres of land under cultivation is largely due to the introduction of American agricultural machinery, amongst which are included the improved machines for harrowing and pulverizing the ground. The American harrows are easily managed, whilst some of them answer the purpose of the plough. Pulverizing the soil enables the smallest roots to penetrate the ground and find nutriment. Besides, the seed and surface manure (where such is used) are covered up better by harrowing than by any other method, and, moreover, time and labour are saved. The common toothed harrows that follow the plough are valuable to the farmer, but are nothing like as valuable as those which enable him to dispense with the use of the plough altogether. American mowing and reaping machines are also largely used, as well as gathering, lifting, and stack-thatching machines.

At the present date, December, 1883, on Mr. J. C. Firth's Matamata estate are to be seen two fenced paddocks each containing 700 acres of red clover, and in one of these five Maoris may be seen seated each on an American mowing machine, which cuts 12½ acres of the clover a day. The work is done by contract; the Maoris find their own horses, two to each machine. Farther on, where the clover is ready for stacking, may be seen American wagons fitted with "gatherers," and these wagons when laden move alongside the clover-stack, where by machinery again the load is raised and deposited on the stack exactly where required. Then, when the stack has reached the desired height and size, the thatching-machine prepares the rye-straw or rushes, and the clover is thatched and protected from the weather in a very short space of time.

I may mention that machinery is again used when the clover has to be cut into bales. The steam-engine conveys the cutter alongside of the stack, and the clover hay is cut into handy bales containing 100 lb. each, bound with wire, and placed in wagons for conveyance to parts of the property for the stock, or to market. Labour could not have accomplished such results but for the liberal use made of American machinery. All the leading American manufacturers are represented in the colony. About two-thirds of the agricultural machinery used is of American manufacture, and I am glad to say that a large proportion of it is shipped direct. The value of the direct shipments of agricultural machinery to New Zealand from the United States during the year 1882 was £32,913, or $157,982, against £31,312, or $150,298, for 1881.

### Land under Cultivation in 1883.

*Land under Cultivation.*—Victoria, 2,040,916 acres; New South Wales, 733,583 acres; Queensland, 158,686 acres; South Australia, 2,370,980 acres; Western Australia, 56,691 acres: total Australia

5,360,856 acres. Tasmania, 377,486 acres; New Zealand, 1,389,747 acres. Total Australasia, 7,128,089 acres.

*Land under Wheat.*—Victoria, 969,362 acres; New South Wales, 247,361 acres; Queensland, 10,494 acres; South Australia, 1,746,531 acres; Western Australia, 22,718 acres: total Australia, 2,996,466 acres. Tasmania, 46,721 acres; New Zealand, 390,818 acres. Total Australasia, 3,434,005 acres.

*Land under Oats.*—Victoria, 169,892 acres; New South Wales, 24,818 acres; Queensland, 225 acres; South Australia, 3,457 acres; Western Australia, 1,025 acres: total Australia, 199,417 acres. Tasmania, 28,849 acres; New Zealand, 319,858 acres. Total Australasia, 548,124 acres.

*Land under Barley.*—Victoria, 43,721 acres; New South Wales, 6,474 acres; Queensland, 504 acres; South Australia, 12,186 acres; Western Australia, 4,766 acres: total Australia, 67,651 acres. Tasmania, 3,229 acres; New Zealand, 28,146 acres. Total Australasia, 99,026 acres.

*Land under Potatoes.*—Victoria, 34,267 acres; New South Wales, 14,462 acres; Queensland, 5,133 acres; South Australia, 5,288 acres; Western Australia, 267 acres: total Australia, 59,417 acres. Tasmania, 9,681 acres; New Zealand, 20,488 acres. Total Australasia, 89,586 acres.

*Land under Hay.*—Victoria, 309,382 acres; New South Wales, 179,567 acres; Queensland, 22,001 acres; South Australia, 138,843 acres; Western Australia, 26,959 acres: total Australia, 676,752 acres. Tasmania, 38,043 acres; New Zealand, 61,054 acres. Total Australasia, 775,849 acres.

*Land under other Tillage.*—Victoria, 514,292 acres; New South Wales, 260,901 acres; Queensland, 120,329 acres; South Australia, 464,675 acres; Western Australia, 956 acres: total Australia, 1,361,153 acres. Tasmania, 250,963 acres; New Zealand, 569,383 acres. Total Australasia, 2,181,499 acres.

### PRODUCE OF OATS, BARLEY, AND POTATOES FOR 1883.

*Oats.*—Victoria, 4,446,027 bushels; New South Wales, 617,465 bushels; Queensland, 3,730 bushels; South Australia, 38,472 bushels; Western Australia, 15,370 bushels: total Australia, 5,121,064 bushels. Tasmania, 788,713 bushels; New Zealand, 10,520,428 bushels. Total Australasia, 16,430,205 bushels.

*Barley.*—Victoria, 758,477 bushels; New South Wales, 133,050 bushels; Queensland, 8,982 bushels; South Australia, 134,464 bushels; Western Australia, 66,720 bushels: total Australia, 1,101,693 bushels. Tasmania, 89,739 bushels; New Zealand, 737,163 bushels. Total Australasia, 1,928,595 bushels.

*Potatoes.*—Victoria, 129,605 tons; New South Wales, 43,461 tons; Queensland, 14,861 tons; South Australia, 16,133 tons; Western Australia, 667 tons: total Australia, 204,727 tons. Tasmania, 37,526 tons; New Zealand, 104,581 tons. Total Australasia, 346,834 tons.

*Hay.*—Victoria, 327,385 tons; New South Wales, 242,921 tons; Queensland, 36,690 tons; South Australia, 104,370 tons; Western Australia, 26,956 tons: total Australia, 738,322 tons. Tasmania, 49,513 tons; New Zealand, 75,764 tons. Total Australasia, 863,599 tons.

### AVERAGE PRODUCE PER ACRE FOR 1883.

*Wheat.*—Victoria, 9·03 bushels; New South Wales, 16·35 bushels; Queensland, 13·89 bushels; South Australia, 4·21 bushels; Western Australia, 11 bushels; Tasmania, 20·27 bushels; New Zealand, 26·28 bushels.

*Oats.*—Victoria, 26·17 bushels; New South Wales, 24·88 bushels; Queensland, 16·58 bushels; South Australia, 11·13 bushels; Western Australia, 15 bushels; Tasmania, 27·34 bushels; New Zealand, 32·89 bushels.

*Barley.*—Victoria, 17·35 bushels; New South Wales, 20·55 bushels; Queensland, 17·82 bushels; South Australia, 11·03 bushels; Western Australia, 14 bushels; Tasmania, 27·79 bushels; New Zealand, 26·19 bushels.

*Potatoes.*—Victoria, 3·78 tons; New South Wales, 3 tons; Queensland, 2·9 tons; South Australia, 3·05 tons; Western Australia, 2·5 tons; Tasmania, 3·88 tons; New Zealand, 5·1 tons.

*Hay.*—Victoria, 1·06 tons; New South Wales, 1·35 tons; Queensland, 1·67 tons; South Australia, 0·75 ton; Western Australia, 1 ton; Tasmania, 1·3 tons; New Zealand, 1·24 tons.

During the years from 1874 to 1880 the highest average production of wheat to the acre in New Zealand was in 1876, when it was 31·54 bushels, and the lowest in 1879, when it was 22·94. The mean of the seven years was 27·29. The next highest average amongst the colonies was that of Tasmania, with 18·25, but the total annual production for that period in that colony in 1880 was only 750,040 bushels. The mean production of wheat per acre for the seven years in the other colonies was as follows: Victoria, 13·03; New South Wales, 14·49; Queensland, 10·76; South Australia, 8·80; Western Australia, 12·05. In making a comparison of the production of wheat per acre between these colonies and England, New Zealand is the only one that in this respect beats the Mother-country. The average produce of wheat in England for the fourteen years ending 1879 (inclusive) was 26½ bushels per acre, and in 1879 the production was as low as 18 bushels. In England very great attention is given to the cultivation of wheat. The supply of land being limited, the utmost skill is employed in fertilizing the soil, and moreover the harvesting there is always very closely done. The production of wheat in France is 16·2 bushels per acre; in Saxony, 22·5; in Belgium, 20·3; while in Russia it is as low as 5·5 bushels. The figures I have given are sufficient to show the proud position New Zealand occupies in wheat-production per acre. Still, I must mention that farming is partially done here on the rotation system universally practised in England. Besides changing the crops every year, or allowing the land to rest, the farmers of New Zealand import annually about 5,000 tons of bone-dust and 2,000 tons of guano for the purpose of enriching the soil. These manures are, however, chiefly used in the North Island. In all the crops the superiority of New Zealand to the other Australasian Colonies is conspicuous.

The mean average of the seven years in New Zealand for oats was 33·42 bushels to the acre, while Victoria gave 19·57 bushels, New South Wales 19·44 bushels, and South Australia 13·07 bushels. The average of potatoes to the acre was in New Zealand 5·13 tons, in Victoria 3·27 tons, in New South Wales 2·96 tons, in Queensland 2·42 tons, and in South Australia 3·35 tons.

New Zealand oats have won great reputation in European markets on account of their superior quality. It is perhaps not generally known that there is a very great difference in the quality of this kind of grain, and that much depends on the weight per bushel. While one bushel of oats will weigh 24 lb. another will weigh 48 lb. It is seldom that New Zealand oats, and especially those grown in the North Island and in the northern part of the South Island, weigh less than from 40 lb. to 48 lb. per bushel. It will be well for the New Zealand farmer not to lose sight of the extra weight of his oats, for it is the custom in European markets to buy by the quantity and to sell by the weight.

The quality of wheat grown in New Zealand is also worthy of note. There are several varieties peculiar to the colony, and which have been successfully introduced into Victoria, New South Wales, and South Australia. Among these is the celebrated New Zealand "Sharman" wheat. This variety is a bearded wheat, free from red rust and smut, and yields a small but plump grain. It has a thin, hard, wiry straw, of a peculiar brightness, about 3 feet 4 inches in height, bearing heads from 3 inches to 4 inches in length, and containing from fifty to sixty grains each. Dr. Schomburgh, who is an authority on agriculture in Australasia, classes the Sharman wheat along with the celebrated American brands the "Defiance" and "Champlain." The two latter he thinks superior to all others. Their earliness, combined with great vigour and rust-resisting properties, makes them very popular. The Defiance displays great productiveness and hardness. It is a beardless white chaff wheat, with heads frequently 3 inches to 5 inches long, very closely set, with large kernels often numbering from sixty to eighty. The Champlain is also very productive. It is a bearded wheat, and yields a plump, coloured grain. Its strong and vigorous straw stands erect about 3 feet 8 inches high, bearing heads from 3 inches to 5 inches in length, and containing from sixty to seventy kernels each. Velvet wheat is largely used in New Zealand for winter, and the Tuscan wheat for spring crops.

The cost of growing wheat in New Zealand is becoming less every year. The progress made in the art of farming, and the very general introduction of American machinery, are the principal reasons for the change. To illustrate more fully the progress made within the last few years I will state that Messrs. Ellis and Brothers, the owners of the celebrated Five Rivers Estate, in Otago, grew wheat in the year 1880 at the cost of 3s. 10d., or 92 cents, per bushel, inclusive of charges for delivering the same on board ship. The cost was estimated from an average yield of 16 bushels per acre as follows: Cost of putting in crop, 15s. 7½d., or $3 75c., per acre; reaping to stacking, 16s. 4½d., or $3 93c., per acre; for threshing and delivering on board, 11s. 4d., or $2 72c., per acre; for rent and seed, 10s. 5d., or $2 50c., per acre: equal to £2 13s. 9d., or $12 90c. The same tract of land yielded in 1883 an average of 22½ bushels per acre, and the cost of production was as follows: Putting in crop to stacking, £1 5s. 3d., or $6 6c.; threshing and delivering on shipboard, 11s. 11½d., or $2 87c., per acre: equal to £1 17s. 2½d., or $8 93c. Messrs. Ellis and Brothers employed in their last harvest a large number of McCormick's wire reapers and binders, seven of which were kept running day and night, and cut on an average 140 acres per day, or 20 acres to each reaper per day.

There are in the Australasian Colonies 297,800 persons engaged in agricultural pursuits, of whom 54,447 reside in New Zealand. It is reasonable to expect that this number will soon be largely increased, as new land is being opened up every year, and the Governments of all the colonies are giving especial attention and every encouragement to the immigration of farmers from European countries. There is throughout all Australasia a steady demand for farm labour. The wages paid to farm hands are in advance of the wages last year, and range from £1, or $4 80c., to £1 10s., or $7 20c., per week, with board and lodging. Harvesters and teamsters get from £2, or $9 60c., to £3, or $14 40c., per week, with board and lodging.

The total value of the exports of grain from New Zealand for the year ended the 31st December, 1882, was £907,961, or $4,358,213, against £986,072, or $4,733,145, for 1881. Of these exports, wheat amounted to £736,224, or $3,533,875; oats, £138,155, or $663,144; and barley, £24,404, or $117,139.

The export of flour from New Zealand during the year 1882 was larger than that of any previous year. It showed an increase of 10,379 tons over the export for the year 1880, and 7,712 tons over that of the year 1881. I give below a table showing the quantity and value of the exports of flour from the Colony of New Zealand for each year from 1872 to 1882, inclusive:—

| Year. | Quantity. | | Value. | |
|---|---|---|---|---|
| | Tons | cwt. | £ | $ |
| 1872 ... ... | 502 | 7 | 7,554 | 36,259 |
| 1873 ... ... | 934 | 15 | 11,942 | 57,321 |
| 1874 ... ... | 2,210 | 15 | 27,330 | 131,184 |
| 1875 ... ... | 636 | 14 | 7,700 | 36,960 |
| 1876 ... ... | 497 | 0 | 7,049 | 33,835 |
| 1877 ... ... | 960 | 5 | 14,315 | 68,712 |
| 1878 ... ... | 4,031 | 1 | 48,441 | 232,516 |
| 1879 ... ... | 1,277 | 18 | 13,373 | 64,190 |
| 1880 ... ... | 553 | 10 | 6,008 | 28,838 |
| 1881 ... ... | 3,220 | 5 | 34,970 | 167,856 |
| 1882 ... ... | 10,932 | 0 | 119,805 | 575,064 |

It will be seen from the above table that there has always been great fluctuation in the quantity of these exports. In 1873 the quantity was 935 tons; in 1874 it increased to 2,211 tons; in 1877 the amount fell to 960, and rose in 1878 to 4,031 tons, and in

1882 to 10,932 tons. This fluctuation is partly due to the amount of flour available for export, and to the demand for breadstuffs in foreign markets. Great improvement has been made within the last few years in the manufacture of flour in New Zealand, and one Auckland firm, celebrated for its superior brands, has received a contract for supplying flour to the French Government at New Caledonia. The increase in the export of New Zealand flour has awakened great competition amongst the millers, and some of their brands command a higher price than would be expected from the cost of wheat.

There has also been in the United States a vast increase in the export of flour. Indeed, the increase is so large as to indicate that the American merchant will find it much more profitable in the future to export flour than grain. The increase for the six months ended the 31st December, 1882, as compared with same period for the year previous, was 560,000 barrels, or at the rate of 1,120,000 barrels per annum. There is now no longer a prejudice existing against American flour in the European markets. In fact, its superior quality has become proverbial. The extraordinary increase in the exports furnishes the strongest possible evidence of the activity of the American flour-mills, and there is every reason to believe that the production of flour will increase in the future in quite as great a ratio as in the past.

The most extensive farm in the North Island is the celebrated Matamata estate, belonging to Mr. J. C. Firth, one of the ablest and most public-spirited of the early settlers of this colony. This estate is about sixty-five miles from the City of Auckland, and contains over 60,000 acres of freehold land, four-fifths of which consist of excellent light soil, admirably suited for grass, clover, and root crops. The remaining portion is of an undulating nature, well adapted to the growth of grain. Only about 13,000 acres have as yet been put under cultivation, of which 2,500 acres are used for wheat. The storage buildings at the wharf, on the Waihou River, are very fine, and here Mr. Firth's steamers discharge their cargoes. All the stations on the farm are connected with one another by telephone, and traction engines are used instead of drays and horses for carrying large loads between the stations and the landing-place. The agricultural machinery and implements, a large part of which are of American manufacture, cost £7,292, or $35,000. Mr. Firth is making preparations to put a larger portion of his land under wheat than heretofore, and the latest English and American agricultural implements have been imported for that purpose. I was fortunate enough to visit his farm during the harvesting, and the "velvet winter" wheat I saw threshed there was, I think, the finest ever grown in any part of the world.

The yield of the present harvest in various parts of the South Island is unusually large. Mr. E. Menlove, of Windsor Park, Otago, has obtained an average of over 50 bushels to the acre from 350 acres. At Totara Mr. R. McAuly obtained 65 bushels per acre from 300 acres. Mr. William Clark, of Cave Valley, got 64 bushels per acre from 130 acres; and on 300 acres of land belonging to Mr. William Meek, in the same district, an average of 72 bushels of wheat per acre was obtained. In fact, I have not heard of a single farm in the South Island where the average has been less than 30 bushels per acre.

The best wheat in New Zealand is grown in the South (or Middle) Island, where also the largest yield per acre is obtained. Land there, in Otago and in Canterbury, has steadily advanced in value. The alluvial soils of the Canterbury Plains and Southland are of the most remarkable fertility. According to Dr. Hector, the Colonial Geologist, the low rolling downs formed by the calcareous rocks of the Tertiary formation which skirt the mountain masses, and which have their quality improved by the disintegration of interspersed basaltic rocks, rank second to no other land in the colony. This is the character of much of the land in the South Island. The soil in the District of Taranaki (North Island) is also very rich. There the surface soil is formed by the decomposition of calcareous marl, which underlies the whole country, intermixed with the *débris* of the lava streams and tufaceous rocks of the extinct volcanic mountain. The richest districts in the North Island have not yet been fully explored. In that Island the soil is well watered and the seasons are always favourable. Of course it is not to be expected that wheat will grow too far north, as the climate is warmer there (the seasons being reversed south of the equator), and the rainfall more frequent in harvest time, making the grain liable to sprout. The trouble heretofore in the North Island has been that the best land was in the possession of the Maoris, and the Europeans have hitherto been forbidden to enter the Maori King country. Vast tracts of land were blocked up in this way: but now a change has taken place. The Maoris, through the firmness and energy of the present New Zealand Government, have agreed to permit the construction of a railway through the prescribed region, which will result in opening up for settlement many millions of acres of the most fertile land in the Southern Hemisphere.

Grain is not shipped in New Zealand nor in any of the Australasian Colonies with that skill and expedition universally practised in the United States. Indeed, even in the large grain centres of this colony very little attention is paid to classifying the grain, and only forwarding that class adapted to stand a long voyage and command a good price in foreign markets. It is indeed deplorable to witness the vast amount of labour—and labour is money—to say nothing of the length of time, spent over the transportation of grain from the farm to the ship. The sacks in the first place are too large and heavy (each sack containing 270 lb., 4½ bushels of grain) to be handled with anything like ease. The men are obliged to use hooks, which of course damage the sacks and do great harm. If the American system were adopted much would be saved which is now lost by the old-fashioned and tedious method of weighing the grain. The farmer is at present paid for the weight of his grain per bushel—wheat at 60 lb. per bushel, barley 50 lb., and oats 40 lb. per bushel. If the grain were put into 100-lb. sacks, as in America, and the grain properly classed, he would know how much grain he had as soon as the last sack left his farm, whereas he has now to wait several days for his grain to be discharged and weighed. The

European importers are constantly drawing comparisons favourable to the manner in which grain is shipped in the United States as against that practised in the Australasian ports. It is no exaggeration to say that it takes about as many weeks here as it would days in the United States to load a ship with grain. When the crops increase, which they are sure to do, the disadvantages of the present system will become so patent that the people will be forced to make the change.

## HORSE-BREEDING.

Ever since the first importation, in 1881, of a small number of American trotting horses into Victoria, great interest has been awakened in the sport of trotting in the Australasian Colonies. In deed, this sport is becoming everywhere more and more popular. In Victoria, Dr. Weir and Mr. J. J. Miller have been very energetic in promoting its interests. The former gentleman has just completed a splendid track at Elsternwick Park, one of the most beautiful spots in Australasia.

At a recent meeting of leading citizens in Melbourne it was resolved to give this amusement every encouragement. The first race took place there in May, 1882, and attracted very general attention. There does not appear to be any just reason why this kind of sport should not be as popular with the people as racing. It is well known that trotting is one of the three natural gaits of the horse, and indeed, as to that matter, of all quadrupeds, for it enables them to balance themselves with firmness and ease. Perhaps no other gait can give such a free and determined motion to the horse. By trotting, his limbs and shoulders are rendered supple and strong, thus enabling him to acquire a quick, steady, and united action.

Mr. J. J. Miller recently visited the United States, and while in Kentucky was fortunate enough to procure, among other fine horses, the celebrated trotter Contractor. Contractor was purchased for the sum of £1,250, or $6,000, and his safe arrival in Melbourne created much excitement. He is 15½ hands high, eight years old, and is regarded as a perfect animal. He possesses a good temper and a good constitution, and his breeding is undeniable. Mr. Miller also purchased a very handsome Kentucky mare, of a bright black colour, called Tilda, by Mambrino, Patchen from Edwin Forest's mare, and own sister to Rothschild, Silver Chief, and Hailstorm.

The Pacific mail steamer "City of Sydney" brought to Auckland, on a recent trip from San Francisco, eleven thoroughbred American trotters. These horses were purchased in Kentucky for Mr. Robert Wilkin, a gentleman residing at Christchurch, where it is intended to lay down a track. The following are the pedigrees of some of Mr. Wilkin's American trotters: Stallion, Blackwood Abdallah, bay colt, 4 years, by Homer, dam by Blackwood; bay colt, yearling, by Harold, dam by Belmont; bay filly, 3 years, by Messenger Chief, dam by Davy Crockett, jun.; chestnut filly, 3 years, by Second Almont; bay mare, 4 years, by Vanderbilt, dam by Hughes's Forest; bay filly, 4 years, by Garrard Chief, dam by Kolmell's Belshazzar;

bay mare, 5 years, by Tom Stamps, dam by Bourbon Chief; brown mare, 4 years, Bay Mamorino, King Fanny by Flying Cloud.

The enterprise at Christchurch, like that in Victoria, is being watched with no little interest, and in the event of its success, which very few now question, there will, of course, be other and larger importations of horses of this kind from the United States, the home of the fastest trotters in the world. Indeed, there is every reason to believe that the importation of American horses to New Zealand will prove a profitable industry. Those that have arrived here have attracted much attention. Many flattering notices have been given them in the newspaper Press, and the Auckland *Herald* says, "These Kentucky trotters mark a new era in the history of stock-raising in New Zealand."

The carriage horses generally in use here have very little to commend them. If a stud were established in Auckland for the purpose of breeding carriage horses it would, I think, prove a very profitable enterprise. Indeed, such a thing as a good fly or carriage horse is not common in New Zealand, nor is there here anything like that class of horse known in America as the cob. The nearest approach is the offspring of a mare with a strain of draught when put to a light stallion. The price of these horses varies from £12, or $58, to £50, or $240; but a superior animal of this kind would readily bring a much higher price. Ordinary saddle horses sell here from £10, or $48, to £35, or $168. Mr. R. J. Creighton, the Agent of the New Zealand Government at San Francisco, who always writes with such intelligence and vigour on the trade relations between the United States and Australasia, in a recent communication directs the attention of the people of this colony to the superiority of American carriage and buggy horses over those of other countries. He says the care and attention bestowed upon breeding fast roadsters in the United States have produced the finest class of carriage horses in the world, and, as the business is in its infancy, there is no telling what its limit may be. Mr. Creighton recently paid a visit to Governor Stanford's celebrated stock farm at Palo Alto, near San Francisco, California, and in giving an account of the visit says, "The farm contains 537 head of horse stock, mostly all yearlings and two years, in addition to the most famous dams and sires that money could purchase." He mentions the fact that the whip is never used at Palo Alto on the horses, and that it is not only forbidden to strike an animal, but an angry word by any of the hands is followed by instant dismissal.

Mr. John Kerr, of Nelson, New Zealand, is now in the United States purchasing horses for New Zealand, and Mr. R. W. Cameron, who did so much towards promoting the success of the International Exhibition at Melbourne, has recently shipped to this colony some very valuable blood stock, and I learn from various sources that other shipments are being contemplated. The truth is, American horses have been looking up ever since Foxhall and Iroquois won the blue ribbons of the French and English turf.

The success of the Auckland Stud Company, and other similar undertakings in New Zealand, furnish abundant evidence as to what can be done in the way of systematic horse-breeding in this colony.

In all these establishments the stallions and brood mares are of the highest lineage. Many of them have been imported from England at a very heavy price, and especially those purchased by the Auckland Stud Company, and by Mr. E. G. Stead, of Christchurch. Among the horses recently imported from England by that gentleman is the celebrated stallion Apremont, full brother to Chamant, the two-thousand-guinea winner at Newmarket, who was recently sold for £6,250, or $30,000. Apremont's pedigree shows that he is a descendant of some of the finest horses whose names are recorded in English and French stud-books. Mortimer, the sire of Apremont, was himself a great racehorse, and was purchased last year for the American turf. Arancana, the dam of Apremont, is by the Touchstone horse Ambrose, from Pocahontas, dam of Stockwell.

Three years ago the Auckland Stud Company had but one stallion and two or three mares. It is now the leading stud company in Australasia. Indeed, none can be compared to it, either in regard to the number and character of the stock, or to the skill and ability with which it is managed. Amongst the thoroughbred horses belonging to the Auckland Stud Company are the celebrated stallions Musket, Cap-a-pie, Anteros, and Sterlingworth. These horses will compare favourably with the most famous horses in Europe and America, and are unsurpassed for beauty, quality, substance, and correct breeding in this hemisphere. Every one of these horses has an interesting history. Musket, the chief horse of the company, was purchased in England at the break-up of the late Mr. J. Payne's stud. He is about 16½ hands in height, and his colour is of a very dark brown. He is compactly and symmetrically built. His head is unusually small, but well-shaped and bloodlike, and is set proudly on a good muscular neck. His shoulders are oblique and very strong, and his propelling power behind is excellent. From the hock he is admirably let down. His splendid staying properties appear to have been transmitted to his progeny. The Hon. James White, of New South Wales, paid 1,250 guineas, or $6,300, for a seven-months-old colt, Martini-Henri, by Musket out of Sylvia. This, I believe, is the highest price ever paid for a colt of that age in the Australasian Colonies. Martini-Henry has won the 1883 Melbourne Cup and other races in Melbourne, having made the fastest time on record, and should he win the races for which he is entered in Sydney, New South Wales, in March, 1884, it is the intention of his owner to take him to England to compete for the St. Leger Cup. Musket is by the same sire as Strayshot (dam of Shotover), winner of the English Derby.

Next to Musket, Cap-a-pie is the greatest favourite among the Stud Company horses. Cap-a-pie was bred in New South Wales by Mr. A. Town, and was purchased by the company for the sum of 1,000 guineas, or $5,040, and has proved himself to be an excellent horse. He is by Maribyrnong, out of Miss Magus; and, while on the turf, beat Chester, the best horse of the year at weight for age. His colour is a beautiful bright brown.

Anteros ranks next to Cap-a-pie, and is a great favourite. He is by Loiterer, out of Adrasta, and was imported from England about six years ago by the late Mr. Malloch, of Christchurch, and, at the break-up of that gentleman's stud, was purchased by the company for 400 guineas, or $2,016. He stands about fifteen hands, and is of a bright-chestnut colour.

Sterlingworth, by Sterling out of Chillianwallah, was recently imported from England at a cost of 600 guineas, or $3,024. Sterlingworth's breeding is of a very high order.

The Auckland Stud Company also pays much attention to the improvement of the breed of draught horses. Amongst those purchased for this purpose Roseberry is perhaps the finest animal. Indeed, it would be difficult to find in any other part of the world a finer horse of this kind, or one of grander quarters. He is of a bright-bay colour, and is prettily marked with a star in the forehead.

There are other very fine draught stallions belonging to the company and well known throughout the colonies, Elgin being amongst them.

The company's Clydesdale mares are equally worthy of attention, and especially Emma and Lillie. Emma was four years old in May last, and was bred by Mr. David Riddell, Blackhall, Paisley; sire, Darnley, dam by Young Campsie. Emma is a bright bay, white stripes on face, near hindfoot white.

Lillie is three years old, and was bred by Mr. D. McFarlane, Glasgow; sire, Darnley, dam by Kerr's Conqueror. Lillie is a rich dark brown, small star on face, and white hindfoot.

The company may justly be proud of their thoroughbred mares. The following were recently imported from England at very high prices: Atlantis, by Thormanby out of Hurricane; Rosette, by Lord Lyon out of Rouge Rose (Rouge Rose, by Thormanby, is a sister of Bend-d'Or, who won the Derby in 1880); Trumpeter, out of Maid of Masham; Bergereve, by Saunterer out of Lass o' Garrie; Clytemnestra, by Blair Athol, dam by Birdcatcher; Mersey, by Knowsley Clemence; Sister Agnes, by Rosicrucian out of Nameless. The company also owns several highly-bred colonial mares, including Sylvia, Raupo, Onyx, Nightshade, Moonbeam, Moonlight, and others.

The affairs of the company have been well managed. The board of directors have exercised great care and judgment in selecting only the best stock for breeding purposes.

The following sales were made by the company during 1882: Greendale, £740, or $3,550; Maggie, £64, or $310; Penrose, £63, or $300; Martini-Henri, £1,312, or $6,300; Knottingly, £156, or $750; Hancock, £63, or $300; Graham No. 1, £73, or $350; Nancy, £42, or $200; Prince Arthur, £42, or $200; Champion colt, £48, or $232 50c.; Champion colt No. 2, £42, or $200; Graham No. 1 filly, £21, or $100; Beanstalk, £125, or $600; Moonstone, £156, or $750; Aërolite, £156, or $750; Farmer, £42, or $200; Graham No. 2, £47, or $225; Prince Arthur colt, £52, or $250; Polly, £52, or $250; Rosey, £42, or $200; Fergus Duke, £78, or $375; Maggie filly, £21, or $100; Prince Arthur, £210, or $1,000; and several others.

The company has recently purchased a fine estate. It is situated on the Great South Road, about eight miles from Auckland, and contains 620 acres of the most fertile land in the district—dry and volcanic, and laid down in grass. The stables have a frontage of 130 feet, with a depth of 72 feet, forming a quadrangle, and divided into a series of loose boxes. Some of the boxes are 20 feet by 12 feet. At the rear are the fodder-rooms, which are easily accessible, and in case of fire readily shut off. In the centre of the quadrangle is a large harness-room. Behind the boxes is a covered passage, 6 feet in width, to give easy supervision of the stock. Water is laid on throughout the building. The water is supplied from a tank, containing 20,000 gallons. Off the passage to the harness-room are stairs leading to the rooms of the grooms in charge. A residence containing ample accommodation, with every convenience, has been erected for Major Walmsley, the manager.

## AMERICAN WOODENWARE.

Nearly all the woodenware imported into New Zealand is of American manufacture, and it is gratifying to be able to state that about three-fourths of it is brought here direct from America. The annual value of the imports is about £20,833, or $100,000. This amount is exclusive of certain articles of ironmongery combined with wood, also of doors, window-sashes, and all kinds of household furniture. If furniture and other articles of wood manufacture were included the amount would be increased to over £125,000, or $600,000. The woodenware trade embraces such articles as tubs, pails, washboards, oars, axe-handles, broom-handles, shoe-pegs, clothes-pins, wooden screws, rolling-pins, butter-churns, cheese-moulds, step-ladders, bread-boards, trays, platters, croquet and lawn tennis sets, chessmen, checkers, oak rims, felloes, poles, shafts, shade- and blind-rollers, ice-chests, &c. It is now very generally admitted that, with few exceptions, these articles can be manufactured cheaper in the United States than elsewhere. The choicest woods for such purposes can be obtained in America at very low prices, and moreover there is no other country that has so many wood factories and saw-mills, and so many ingenious machines for the manufacture of all kinds of woodenware. There are several firms in the United States that have extended their trade to this colony. It is known, not only in New Zealand, but throughout Australasia, that Crane and McMahon, of New York, have factories and saw-mills in almost every State in the Union, and that their factory at Greensborg, North Carolina, turns out 10,000 spokes and 300 sets of rims per day. The elm, hickory, and oak rims are made of thoroughly-seasoned timber, and are in great request here. Many of the adjustable window-shades used in Auckland are of American manufacture. Hartshorn's patent shade-roller has been introduced into every city in the colony. With the help of this roller the window-shade is very easily adjusted. The springs are made of the best tempered steel, and conform to exact weights and lengths, and each part of the roller is tested by a separate gauge. The automatic stop admits of any required degree of spring being held in reserve, thus providing for any loss of power from diminishing elasticity, and allowing for shades of different size and weight

The imports of woodenware from England and Germany consist of bread-platters, butter-prints, forks, spoons, faucets, chess, checkers, boards, pepper-grinders, &c. Of the above, the checkers, chessmen, and boards come from Germany; the rest are of English manufacture. The chief feature of English and German woodenware is a maximum of labour with the smallest amount of material.

The cost of freight, Customs duties, commissions, &c., make the prices of all kinds of woodenware much higher in New Zealand than in the United States. The duty, however, on woodenware is only 15 per cent. ad valorem; and certain articles, such as brushwood ware, buggy-shafts, bent wheel-rims, carriage-spokes, felloes and naves, butter-churns, axle-arms, boxes, ships' blocks, &c., are admitted free. There is no demand here for wooden buckets, galvanized iron ones being used instead. Cylinder churns, size No. 1, sell for £1 2s. 11d., or $5 50c.; No. 2, £1 7s. 1d., or $6 50c.; No. 3, £1 9s. 2d., or $7; No. 4, £1 13s. 4d., or $8; butter-workers, from £1 11s. 3d., or $7 50c., to £2 12s. 1d., or $12 50c., each; croquet sets, from 12s. 6d., or $3, to £1 5s., or $6.

New Zealand has developed the largest timber industry in the Southern Hemisphere. The immense forests of kauri, totara, and other timber-trees are fully appreciated by its enterprising inhabitants. Of the various kinds of timber used for manufacturing purposes the kauri is the most valuable. The kauri forests of Auckland available alone cover over 200,000 acres.

There are about 225 saw-mills and sash-and-door manufactories in New Zealand. The value of the land and buildings is about £397,084, or $1,906,003; and the value of the machinery and plant is £376,544, or $1,807,411. About 4,300 persons are employed in connection with these mills.

The New Zealand wood factories excel in the excellence of their doors and window-sashes. These factories, however, make only a limited quantity of articles known to the trade as woodenware, such as I have described in this report. Their articles of coopery are worthy of praise, especially their butter-kegs, which are made of kauri, totara, and puriri.

Amongst the native woods suitable for the manufacture of woodenware may be mentioned tawa and taraire. White birch, honeysuckle, and other similar woods are used in considerable quantities for axe-handles and small cabinet-work. Agricultural implements are sometimes made of mangeo. Mapau is another excellent native wood, and makes superb carpenters' tools. The greatest obstacle in the way of the wood manufacturers is the high price of labour.

There are several broom factories in Auckland making excellent brooms, and at low prices, the broom being imported from the United States free of duty. The handles, made of kauri, are more inclined to shrink than American pine, but nevertheless are very strong. The washboards turned out by the Auckland Timber Company are the best that I have seen manufactured in the colony. Astonishment is expressed by woodware dealers that the Americans do not manufacture butter-prints for this market. Butter-prints, like bread-platters, must be hand-made, and no machine capable of cutting platters in hollow hemispheres has as yet been introduced.

American wood-working machinery is largely employed in all the principal factories in New Zealand. The Auckland Timber Company uses almost every variety known to the trade, amongst which are Boult's carving and dovetailing machine, Brown and Howe's gauge lathe, the Challenge scroll saw (Seneca Falls, New York), the Eclipse perforator, the Variety wood-turning lathe (by the Rollstone Machine Company, Fitchburg, Massachusetts), Howley and Hermane's new-style power mortiser, with speed of 800 strokes per minute, &c. The Variety wood-turning lathe will turn out several thousand druggists' boxes in a few hours, and an equal number of button and tassel-moulds, knobs, tops, toys, pencilcases, spools, pipe-stems, checkers, &c.

The Eclipse perforator, used by the Auckland Timber Company, is said to be the only round-hole power perforating machine ever placed before the public that will do stub and checker work, and lift at any given or required point. The cutters are so arranged that they shear out the holes, leaving the sheets free, clear cut, and without any bur, and, as the punches are run by gear, they act independently of each other, and run for a long period without wearing out. The cutters are easily sharpened by tapping them on the face with a light hammer. Stub and straight work can be run through at equal speed, as fast as the feeder can put in the sheets, three or four together, the work being delivered in the drop-box clean and flat.

The Timber Company also use the Excelsior lathe of the Globe Manufacturing Company, Middletown, Connecticut. This lathe is so simple in construction that it can be used even by unpractised hands. The length of its bed is 25 inches, and the swing is 5¼ inches. The ways are of iron instead of wood. The machine is capable of doing both fine and common work. The Auckland Timber Company has also a variety of American dimension planes, boring, matching, moulding, mortising, and turning machines, cut-off and slitting saws, hand-sawing machines, knives, wood-turning chisels and gauges, hollow augers, &c.

The cost of freight on woodenware imported into New Zealand from San Francisco is very high. It is about £3, or $14 4c., per ton measurement. The cost on the same goods by sailing-vessels is about £1 10s., or $7 20c., per ton. The New Zealand merchants, however, are opposed to having their goods sent here in American sailing-vessels, for they are slow sailers. Many of them are unfit to carry freight easily damaged. Moreover, the American ships seldom come to Auckland direct. They usually clear for some other New Zealand port —either Lyttelton, Dunedin, or Wellington. Goods shipped in this way are often six months reaching their destination, on account of the slow voyage and the delay occasioned at the intermediate ports. It is stated that the commission merchant at New York represents that the ship, on discharging a portion of her cargo at the first port of call, can easily fill up with New Zealand produce for the second port. The prospect of this second freight, at high figures, has the effect of inducing the master to charter his vessel at a low rate for the round trip. The shipping agent compels him to sign bills of lading at any cost the agent may choose to charge. The owner of the vessel probably gets about £1 5s., or $6, per ton on the cargo; and the agent or charterer £2, or $9 6c., per ton, thus gaining a profit of over 50 per cent. The merchants here object to the long delay in the transportation of their goods. The loss falls principally on the merchants at the second or third port of call. I am fully conscious of the value of the services of commission-men to the importers, but trade upon a large scale should be conducted independently of them. The defence made by the shipping agents is to the effect that the Auckland merchants do not order goods enough to fill a large ship, hence they are compelled to take freight for intermediate ports; but, even supposing this to be the case, small vessels could easily be chartered for the Auckland trade. Some of the New York exporters complain that they are in the hands of the shipping agents, and that, if they send goods by outside vessels, the shipping agents will refuse to carry further freight for them. It is always difficult to get at the precise facts in cases of this kind, but one thing is certain—that the great bulk of American merchandise is not shipped here direct, but by way of London.

## SYSTEMS OF CREDIT.

It is believed that credit stimulates trade in New Zealand, from the fact that it inspires confidence in the debtor. When a man is fortunate enough to secure credit from one merchant he has little difficulty in securing it from another. In this way the public soon acquire confidence in his honesty and capabilities. Success, and sometimes even the appearance of it, excites enterprise and competition in a community. The best business men with whom I have conversed in various parts of the colony do not hesitate to express the opinion that if credit were not given few business enterprises would be started, much less sustained. The merchant who extends credit takes part of the risk in the enterprise of the debtor, and very naturally does what he can to support him, directly and indirectly. Of course, credit is often extended to those who do not deserve it, but instances of this kind are not frequent enough to affect the general principle.

The people of New Zealand are not adverse to contracting debts. In truth, the present credit systems of the colony are so popular that any proposal to seriously change them would be likely to meet with most determined opposition. The mechanic or labourer, temporarily pressed through want of work, sickness in his family, or other causes, is of course benefited by credit. The facility with which credit is obtained, and the disposition of the people to avail themselves of it, are cited as strong reasons for the frequency of insolvency in the colony. The public works policy inaugurated by the Government in 1870, which consists of a system of borrowing money for the purpose of constructing railways and other public works, developing gold mines, &c., seems to give very general satisfaction. The public debt in 1870 was £7,841,891, or $37,641,076:

since which time it swelled, through successive loans, to £30,357,111, or $145,714,132, in March, 1883. The facility with which these loans are secured in London, and at a rate of interest rarely exceeding 4 per cent. per annum, furnishes very strong evidence of the confidence of the British public in the resources and capabilities of the colony.

There are no sumptuary laws or regulations concerning credit in New Zealand except for minors, or for a wife living apart from her husband. A tradesman cannot recover for goods furnished to a minor, or a wife living apart from her husband, unless it can be proved that they were necessary supplies. A keeper of an hotel cannot recover for liquor supplied on the premises. The New Zealand Act, however, for regulating the sale of liquor provides that the keeper of an hotel may recover for liquor supplied in moderate quantities with meals to any person *bonâ fide* lodging in the house.

The extent of credit in proportion to the volume of trade in New Zealand may fairly be estimated at 90 per cent. in the wholesale and 60 per cent. in the retail trade. This, however, is a general average.

The losses incidental to business of all kinds in New Zealand have been estimated at 2½ per cent. of the volume of trade. This estimate is based upon figures collected by various statisticians of New Zealand, not for any one year but upon seven years' average. Mr. J. McC. Clark, the Mayor of Auckland, is of the opinion that the losses sustained in the dry-goods business throughout the colony do not exceed 1 per cent. of the amount of trade done.

Tradesmen extend credit readily in New Zealand, and indeed in all the Australasian Colonies, to mechanics and labourers. There is a law in New Zealand that deters persons of small means from incurring liabilities that they cannot pay. Imprisonment for debt was abolished by the Act of 1874, but it is provided by that Act, which is still in force, that if a judgment be not satisfied the debtor can be further prosecuted by a judgment summons, the Court being empowered to order that the debt be liquidated in a certain time by periodical instalments. It is further provided that if the debtor fail to comply with the order he shall be sent to prison. The 8th section of the Act reads: "Or if on oral testimony or affidavit, or by both, it shall appear to the satisfaction of such Court that the party so summoned has then, or has had since the time of obtaining such order or judgment, sufficient means and ability to pay the sum so recovered against him, and so due and unsatisfied as aforesaid, or any instalment thereof when an order to pay by instalments has been made, or that he is about to leave the colony without paying such money as is still unsatisfied, or to depart elsewhere within New Zealand with intent to evade payment, then in any or either of the cases aforesaid it shall be lawful for such Court, if it shall think fit, to order that, unless such party shall pay into such Court, either forthwith or by such instalments as the Court may fix, or within the time limited in such order, the money so unsatisfied, with interest thereon at such rate as the Court shall direct, not exceeding five per centum per annum, and the costs of any fruitless writs or warrants of execution and of levies thereunder, together with the costs of and occasioned by such summons and examination, he shall be committed to prison for a period not exceeding three months." The direction of the enforcement of this order is as follows: "Whenever any such order of committal as aforesaid shall have been made, and the money and costs specified therein, or any part thereof or any instalment, shall not have been paid into Court in pursuance thereof, the Registrar of the Court shall, without previous notice or summons to the party required to pay the same, issue a warrant in the prescribed form, and the bailiff of the Court and the keeper of the gaol to whom such warrant is directed shall respectively execute and obey the warrant, and all constables and other peace officers shall aid and assist in the execution of such warrant." If the debtor, however, should satisfy the Court that he has no means of paying, the Court will refuse to issue the order. The Court has also power at any time under special circumstances of any particular case to order the discharge of the person in custody. The Act is so thoroughly understood and is so general in its application that it would be difficult to say that the people are not fully satisfied with it. It is maintained here that the Act prevents the mechanic or labourer earning regular wages from indulging in extravagance. Moreover it is regarded as disgraceful in the extreme to be sued on a judgment summons.

Cash buyers have no advantage, except the usual discount of 2½ per cent. on accounts paid at the end of the month. Some merchants allow a discount of 5 per cent. on cash transactions, but the practice is not general, except on articles of ironmongery, when the discount is from 5 to 7½ per cent.

Interest is charged on accounts not paid at the end of three months, provided due notice is given. The publication on the merchants' billheads or statements of accounts that interest will be charged at the end of three months is deemed sufficient notice. If such notice is not printed or otherwise given he cannot recover interest on time accounts.

By the Mercantile Law Act of 1880 of New Zealand the laws of England relating to usury are declared not to be in force in this colony. In section 44 the Act provides that "There shall be no limit to the amount of interest which any person may lawfully contract to pay." Section 45 of the same Act reads: "In all cases where interest for the loan of money or upon any other contract may be lawfully recovered or allowed in any action, suit, or other proceeding, but where the rate of such interest has not been previously agreed upon by or between the parties, the party entitled to interest shall not be allowed to recover or receive above the rate of eight pounds for the interest of one hundred pounds for a year, and so after that rate for a greater or lesser sum than one hundred pounds, or for a longer or shorter time than a year."

In the wholesale trade, promissory notes, payable three months after date, and bearing interest at the rate of 10 per cent. per annum, are usually given.

The evils of credit are more conspicuous amongst working-men and small traders than any other classes. When a man of business knowledge and experience in any particular line, but without capital, wishes to engage in trade on his own account, he has little difficulty in finding a merchant or capitalist to supply him with the necessary goods or merchandise. Nearly all the small butchers' shops and tobacco stores in the large towns of New Zealand are partly or wholly owned by a few leading merchants. Small liquor-dealers are usually set up in the same way. They derive for themselves but little profit from their business, and in a short time their establishments are either closed or turned over to some one else. When small tradesmen are not thus supplied, their stock is usually pledged to the banks or to some capitalist.

Credits of record, mortgages, judgments, &c., are prevalent in New Zealand. Indeed, a large majority of those engaged in business have their property heavily mortgaged. Those who have not studied the various methods of acquiring property in this colony would be amazed at the extent to which real estate is mortgaged. The residences of tradesmen are largely affected by money obtained in this way. There is no class of law business more profitable than the preparation of the necessary papers for the mortgage of property. The annual receipts by the Government alone, in fees collected for the registration of deeds for land, amount to £40,000, or $192,000. The Land Transfer Act returns for the year ended the 31st March, 1883, show the following interesting facts: During the year 4,910 acres town and suburban and 1,036,630 acres rural land were mortgaged, the sum secured being £5,113,604, or $24,545,299. In the previous year the figures were: 6,057 acres town and suburban and 1,231,166 acres rural land, the sum secured being £6,151,795, or $29,528,616. This amount does not represent all the mortgages registered, as a large number of transactions are effected under the deeds registration system previously in operation. The mortgages registered under both systems during the year 1882 in each district were as follow: Auckland, £493,417, or $2,368,402; Taranaki (New Plymouth), £95,065, or $456,312; Hawke's Bay (Napier), £563,606, or $2,705,309; Wellington, £463,828, or $2,226,374; Marlborough, £88,439, or $424,507; Nelson, £96,448, or $462,950; Westland, £28,308, or $135,878; Canterbury, £2,010,394, or $9,649,891; Otago, £1,020,323, or $4,897,550; Southland, £325,357, or $1,561,714: total, £5,185,185, or $24,888,888.

The present bankruptcy law in New Zealand has been repealed, and the new law will come into operation on the 1st January, 1884. The most important changes are the adoption of a system of official assignees, with full power and control over important matters which at present are left in the hands of the creditors. The Official Assignee under the new law is authorized to preside at all meetings of the creditors, decide, subject to appeal to the Court, as to the validity of proxies and proofs of debts, examine and report on the debtor's accounts, consult the creditors, take possession of, protect, and realise the property, examine the bankrupt and creditors. He is also empowered to investigate voluntary settlements, fraudulent preferences, and bills of sale. The Act provides that bills of sale are void unless duly executed six months before the date of bankruptcy, except for actual value in cash or goods received at the time. The Official Assignee has to decide within one month all questions of the acceptance, on behalf of the creditors, of existing leases or agreements. He also distributes dividends, reports to the Court before the bankrupt's final examination, and, when necessary, opposes his discharge whether the creditors are favourable or not. The Act further provides that the Official Assignee shall give sufficient bond or security, and permit the creditors to examine his books at least four times a year. The creditors may appoint supervisors to check his conduct. His accounts are also examined by an auditor appointed by the Governor. The Act is a long one. It provides very severe penalties for fraudulent bankruptcies. The offences and their punishments are clearly set forth. For certain offences the debtor must be duly indicted and tried before a jury, but the Court has also summary jurisdiction to imprison for a term not exceeding twelve months, with or without hard labour, in such cases as carrying on trade with fictitious capital, omitting, with intent to conceal the true state of his affairs, to keep proper books and accounts, and for unjustifiable extravagance in mode of life. The Court may make conditions as to after-acquired property, and for the payment of so many shillings in the pound before granting the discharge.

The bankruptcy law of New Zealand provides that the property of the debtor divisible amongst his creditors shall not comprise the following: "(1.) Property held by the debtor in trust for any other person. (2.) The tools (if any) of his trade, and the necessary wearing apparel of himself, his wife and children, and his furniture, to the value, inclusive of tools, apparel, and furniture, of twenty-five pounds"—or $120—"or to such further value as the creditors in general meeting may determine."

When a person in business has once failed or been discredited, there is nothing to prevent him from again resuming business, provided he can obtain his discharge from bankruptcy. The discharge of the debtor does not release him from any debts or liabilities incurred by means of fraud, but it releases him from all other debts provable under the bankruptcy, with the exception of the following: "(1) Debts due to the Crown; (2) Debts with which the debtor stands charged at the suit of the Crown or of any person for any offence against a statute relating to any branch of the public revenue, or at the suit of the Sheriff or other public officer on a bail-bond entered into for the appearance of any person prosecuted for any such offence."

Occasionally bankrupts only pay a few shillings in the pound, and afterward extend their business so rapidly that they appear to have largely profited by their failure. There is, however, a feeling of insecurity in trusting a man who has once been discredited, unless his failure was under very exceptional circumstances. In the majority of cases it is supposed that the bankrupt's moral sense has been so blunted by his failure that he will have less scruples than formerly in availing himself of the bankruptcy law.

In proportion to the population of the colony the number of bankrupts in New Zealand is thought to be unusually large. The number, however, is becoming smaller every year. During 1882 there were 1,283 persons in New Zealand that filed their declarations of insolvency. Estimating the total population of the colony at 550,000, there was one bankrupt to every 428 persons. The number *pro ratâ* is much smaller in Victoria and some other Australian Colonies, but I have noticed that the assets of the New Zealand bankrupts make a much better show in proportion to their liabilities than those in the other colonies. The amount of the liabilities of the New Zealand bankrupts during 1882 was £931,791 or $4,472,597; the amount of their assets was £803,072, or $3,854,746, showing a deficiency of £128,719, or $617,851. In 1881 the number of persons filing declarations was 1,375, and the amount of their liabilities was £823,018, or $3,950,486, with assets amounting to £717,380 or $3,443,424.

The new bankruptcy law embraces many of the features set forth in the Bill to amend the Law of Bankruptcy recently passed by the British House of Commons. It will no doubt correct many abuses which have crept into the old law through the neglect or indifference of creditors. The difficulties in the way of framing a bankruptcy law to meet the wants of the people, have led Lord Sherbrooke and other statesmen to advocate the abolition of all bankruptcy laws.

Mr. Alfred De Lissa, a prominent New South Wales lawyer, has recently written a very interesting pamphlet on insolvency, in which he proposes to substitute altogether a new system for the protection of property and the control of credit operations. The principal object of his system is to limit the liability of a debtor, in other words to compel a trader to observe a certain proportion between his actual capital and the amount of liabilities he incurs at any one time, and under which, if the creditors choose, he shall be unable to exceed that proportion. The method is to be carried out by the establishment of a Bureau of Insolvency, and to refer to a Court of law only in matters absolutely requiring judicial functions.

In the early history of the colony the growth of its trade and commerce was very slow, but after the discovery of gold in large quantities a startling impetus was given to every branch of business. Between 1863 and 1871, when the export of gold was the heaviest, the rush to the mines was unparalleled. The yield of the mines was extraordinary. In less than nine months the Caledonian Mine distributed amongst its shareholders over £600,000, or $2,880,000, in dividends, and the shares rose from £12, or $58, to £300, or $1,440, each. The rush to the mines, and the excitement created by every new discovery of gold, awakened the most reckless trading and the wildest speculation. The sudden rise and fall of property brought about a very unhealthy state of affairs. The banks, which have always been well managed here, did what they could to regulate trade. They refused to discount all land-speculation paper, and in a short time business was restored to a normal condition.

The general effects of credit in New Zealand are about the same as in other countries. It is a maxim in political economy that credit makes commodities dearer. This maxim would, of course, apply as well in New Zealand as elsewhere. A very great objection to the credit system is the encouragement it gives to reckless trading. The unscrupulous speculator, finding it an easy matter to obtain credit, rushes into all kinds of enterprises without considering the consequences, and at last ends in bankruptcy. When he deals in commodities the sale of which is precarious, or in articles which are constantly varying in price, the risk he runs is greatly increased. Credit also tends to encourage extravagance and indolence amongst the poorer or working classes. An artisan who obtains goods without payment at the time, not unfrequently indulges in a greater supply and of a better quality than his requirements demand, or his means allow. From this state of affairs two results are obvious: first, the repudiation of small debts; second, a vast number of legal actions for the recovery of debts. These actions give the merchant the reputation of being hard or severe, whilst the debtor is not only compelled to pay the account but the cost of the legal proceedings, which in some cases amounts to more than the original claim.

Very general attention has been directed to the effects of credit on the poorer classes by the introduction of a Bill in the Colonial Parliament, which has for its object the abolition of all laws for the recovery of small debts in the District Courts. This would at once do away altogether with the credit system in the retail trade. Much can be said in favour of the Bill, but much more can be said against it. The fact that such a Bill has been introduced, is cited as an evidence that the effect of credit amongst the poorer and middle classes is an evil demanding a remedy.

# TABLES PREPARED BY MR. W. N. BLAIR, M.INST.C.E.

## THE INDUSTRIES OF NEW ZEALAND.

ABSTRACT of IMPORTS and EXPORTS from 1853 to 1882.

| Year. | IMPORTS. | | | EXPORTS. | | | Year. |
|---|---|---|---|---|---|---|---|
| | Total Imports. | Exclusive of Public Works Plant, and Specie. | Ordinary Imports consumed in the Colony. | Total Exports. | Exclusive of Specie. | Exports the Product of the Colony. | |
| | £ | £ | £ | £ | £ | £ | |
| 1853 | 597,828 | 559,928 | Cannot be separated for these years. | 303,282 | 300,264 | Cannot be separated for these years. | 1853 |
| 1854 | 891,201 | 886,501 | | 320,891 | 300,302 | | 1854 |
| 1855 | 813,460 | 802,344 | | 365,868 | 335,868 | | 1855 |
| 1856 | 710,869 | 710,765 | | 318,433 | 288,433 | | 1856 |
| 1857 | 992,995 | 947,795 | 929,493 | 369,395 | 369,210 | 350,908 | 1857 |
| 1858 | 1,141,273 | 1,109,303 | 1,085,810 | 458,023 | 457,942 | 433,949 | 1858 |
| 1859 | 1,551,030 | 1,544,617 | 1,514,441 | 551,484 | 551,484 | 521,308 | 1859 |
| 1860 | 1,548,333 | 1,473,053 | 1,433,233 | 588,953 | 588,953 | 549,133 | 1860 |
| 1861 | 2,493,811 | 2,412,001 | 2,381,085 | 1,370,247 | 1,370,247 | 1,339,241 | 1861 |
| 1862 | 4,626,082 | 4,395,496 | 4,330,782 | 2,422,734 | 2,422,734 | 2,358,020 | 1862 |
| 1863 | 7,024,674 | 7,021,889 | 6,976,375 | 3,485,405 | 3,388,405 | 3,342,891 | 1863 |
| 1864 | 7,000,655 | 6,643,468 | 6,515,935 | 3,401,667 | 3,178,167 | 3,050,634 | 1864 |
| 1865 | 5,594,977 | 5,277,903 | 5,108,434 | 3,713,218 | 3,672,890 | 3,503,421 | 1865 |
| 1866 | 5,894,863 | 5,755,040 | 5,657,601 | 4,520,074 | 4,493,539 | 4,396,100 | 1866 |
| 1867 | 5,344,607 | 5,254,346 | 5,089,132 | 4,644,678 | 4,644,678 | 4,479,464 | 1867 |
| 1868 | 4,985,748 | 4,616,744 | 4,481,473 | 4,429,198 | 4,404,033 | 4,268,762 | 1868 |
| 1869 | 4,976,126 | 4,832,349 | 4,697,623 | 4,224,860 | 4,224,860 | 4,090,134 | 1869 |
| 1870 | 4,639,015 | 4,522,384 | 4,350,400 | 4,822,756 | 4,716,666 | 4,544,682 | 1870 |
| 1871 | 4,078,193 | 3,833,854 | 3,723,084 | 5,282,084 | 5,281,874 | 5,171,104 | 1871 |
| 1872 | 5,142,951 | 4,768,203 | 4,686,249 | 5,190,665 | 5,189,140 | 5,107,186 | 1872 |
| 1873 | 6,464,687 | 5,908,591 | 5,788,109 | 5,610,371 | 5,598,461 | 5,477,979 | 1873 |
| 1874 | 8,121,812 | 7,194,695 | 7,096,819 | 5,251,269 | 5,250,019 | 5,152,143 | 1874 |
| 1875 | 8,029,172 | 7,285,533 | 7,164,045 | 5,828,627 | 5,597,332 | 5,475,844 | 1875 |
| 1876 | 6,905,171 | 6,485,982 | 6,363,354 | 5,673,465 | 5,611,529 | 5,488,901 | 1876 |
| 1877 | 6,973,418 | 6,391,585 | 6,300,844 | 6,327,472 | 6,169,225 | 6,078,484 | 1877 |
| 1878 | 8,755,663 | 8,225,682 | 8,100,040 | 6,015,700 | 5,906,150 | 5,780,508 | 1878 |
| 1879 | 8,374,585 | 7,614,907 | 7,511,318 | 5,743,126 | 5,667,044 | 5,563,455 | 1879 |
| 1880 | 6,162,011 | 5,855,399 | 5,725,411 | 6,352,692 | 6,232,388 | 6,102,400 | 1880 |
| 1881 | 7,457,045 | 7,211,869 | 7,079,001 | 6,060,866 | 5,895,118 | 5,762,250 | 1881 |
| 1882 | 8,609,270 | 8,292,550 | 8,150,435 | 6,658,008 | 6,395,465 | 6,253,350 | 1882 |

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| CLASSES. | | 1877. | | 1882. | |
|---|---|---|---|---|---|
| | | 417,620 | | 517,710 | |
| | ts. | Imports. | Exports. | Imports. | Exports. |
| | | £ | £ | £ | £ |
| A.—FOOD AND FO | | | | | |
| 1. Wheat and oats .. | 234 | 32,229 | 251,933 | 4,484 | 874,379 |
| 2. Flour, meal, arrowroot, sa | 935 | 99,104 | 22,424 | 30,846 | 131,543 |
| 3. Potatoes and vegetables | 102 | 3,917 | 14,861 | 3,991 | 64,042 |
| 4. Biscuits and confectioner | 731 | 21,408 | 3,470 | 21,421 | 4,371 |
| 5. Bran, pollard, hay, chaff, | 377 | 78,569 | 24,847 | 108,762 | 43,666 |
| 6. Beans and peas, linseed, | 463 | 50,415 | 1,689 | 42,694 | 16,411 |
| 7. Butter, cheese, and eggs | 001 | 1,111 | 40,174 | 1,699 | 62,452 |
| 8. Provisions, hams, meats, | 356 | 40,954 | 71,642 | 41,466 | 92,746 |
| 9. Fruit and nuts .. | 129 | 101,708 | 134 | 127,943 | 795 |
| 10. Jams and jellies .. | | 41,343 | 88 | 22,923 | 159 |
| 1 [illegible] stores, pickles, a | 501 | 77,929 | 1,453 | 88,654 | 1,096 |
| MACHINERY AND MANU QUISITES. | | | | | |
| Machinery for raising and food .. .. | | 76,755 | 1,172 | 93,883 | 250 |
| Machinery for raising and clothing .. .. | | 6,590 | .. | 55,253 | 829 |
| Wood and mining machin | | 11,565 | .. | 16,393 | 60 |
| Steam-engines and other | | 11,102 | .. | 42,728 | 200 |
| Minor appliances and mat | ,855 | 142,711 | 15,052 | 273,603 | 31,243 |
| Metals and metalwork | ,209 | 83,045 | 4,411 | 155,150 | 3,982 |
| Totals .. | ,064 | 331,768 | 20,635 | 637,010 | 36,564 |
| Per head of pop | 1¾ | £0 15 10½ | £0 0 11¾ | £1 4 7¼ | £0 1 4¾ |
| –NATURAL PRODUCTS AND R NOT OTHERWISE INCL | | | | | |
| Gold and silver, in natu coined .. .. | 407 | 426,585 | 1,642,115 | 265,320 | 1,185,493 |
| Coal, coke, charcoal, and | 179 | 242,652 | 13,265 | 166,281 | 12,062 |
| Hides and sheep- and rabb | 872 | 200 | 56,654 | 4,266 | 174,043 |
| Tallow .. .. | 788 | .. | 156,552 | .. | 165,938 |
| Kauri gum and fungus | 094 | .. | 129,666 | .. | 279,308 |
| Phormium .. .. | 405 | .. | 19,457 | .. | 42,711 |
| Cannot be classified .. | | .. | .. | .. | .. |
| Totals .. | ,745 | 669,437 | 2,017,709 | 435,867 | 1,859,555 |
| Per head of popu | 7¾ | £1 12 0½ | £4 16 7½ | £0 16 10 | £3 11 10 |
| Grand totals | ,665 | 6,973,418 | 6,327,472 | 8,609,270 | 6,658,008 |
| Per head of popu | 4 | £16 13 11½ | £15 3 0¼ | £16 12 7 | £12 17 2½ |
| ports afterwards exported | 479 | 248,988 | 248,988 | 404,658 | 404,658 |
| ports consumed in New Z xports, the produce of the co | 186 | 6,724,430 | 6,078,484 | 8,204,612 | 6,253,350 |
| Per head of popu | 4¼ | £16 2 0¼ | £14 11 1 | £15 16 11¼ | £12 |

* There is no direct retur ncluded in other items for three years.

Year.

1853
1854
1855
1856
1857
1858
1859
1860
1861
1862
1863
1864
1865
1866
1867
1868
1869
1870
1871
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1873
1874
1875
1876
1877
1878
1879
1880
1881
1882

AND RESOURCES.

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 166,913 | .. | 2,535 | .. | 3,828 | .. | 69,109 | 12,797 | 91,351 | 9,782 | 76,952 | 36,893 | 1869 |
| | 88,513 | 3,759 | 13,302 | 6,032 | 2,971 | 462 | 60,497 | 37,913 | 30,619 | 14,652 | 102,291 | 60,384 | 1870 |
| 24 | 99,988 | 2,147 | 41,916 | 16,531 | 245 | 2,405 | 59,345 | 95,561 | 42,201 | 11,576 | 55,948 | 42,727 | 1871 |
| .. | 159,442 | 8,472 | 14,762 | 2[illegible],465 | 4,340 | 25 | 90,657 | 337,915 | 63,605 | 8,201 | 27,477 | 41,199 | 1872 |
| 230 | 198,614 | .. | 18,141 | 29,602 | 2,698 | 2,636 | 143,273 | 262,346 | 61,927 | 5,943 | 60,055 | 72,347 | 1873 |
| ,260 | 206,051 | 5,032 | 8,262 | 35,906 | 31,783 | 2,609 | 191,539 | 86,545 | 70,701 | 6,497 | 55,814 | 54,385 | 1874 |
| .. | 108,205 | .. | 7,772 | 20,530 | 12,933 | 2,585 | 213,492 | 93,236 | 160,385 | 30,418 | 66,827 | 90,933 | 1875 |
| .. | 155,740 | 3,032 | 8,[illegible]71 | 15,566 | 28,249 | 4,355 | 192,287 | 68,831 | 73,819 | 13,360 | 52,646 | 85,967 | 1876 |
| ,181 | 162,699 | .. | 56,015 | 39,863 | 41,641 | 336 | 269,656 | 27,858 | 2,205 | 8 | 37,405 | 77,047 | 1877 |
| .. | 207,210 | 16,173 | 165,453 | 21,434 | 131,855 | 23,732 | 432,572 | 43,943 | 48,646 | 30,588 | 42,894 | 79,302 | 1878 |
| ,235 | 155,939 | 2,650 | 77,559 | 14,987 | 103,204 | 18,397 | 438,399 | 59,679 | 46,257 | 19,340 | 52,952 | 66,658 | 1879 |
| 47 | 195,873 | 4,401 | 115,188 | 24,710 | 110,207 | 35,082 | 238,011 | 105,147 | 14,843 | 6,300 | 78,264 | 84,754 | 1880 |
| .. | 243,709 | .. | 149,228 | 11,098 | 121,400 | 54,768 | 343,645 | 355,787 | 29,045 | 51,464 | 86,935 | 74,859 | 1881 |
| .. | 205,338 | 2,561 | 173,371 | 18,835 | 239,988 | 45,174 | 463,493 | 434,684 | 35,002 | 33,669 | 74,889 | 71,548 | 1882 |

e years.

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